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POPULAR MECHANICS MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

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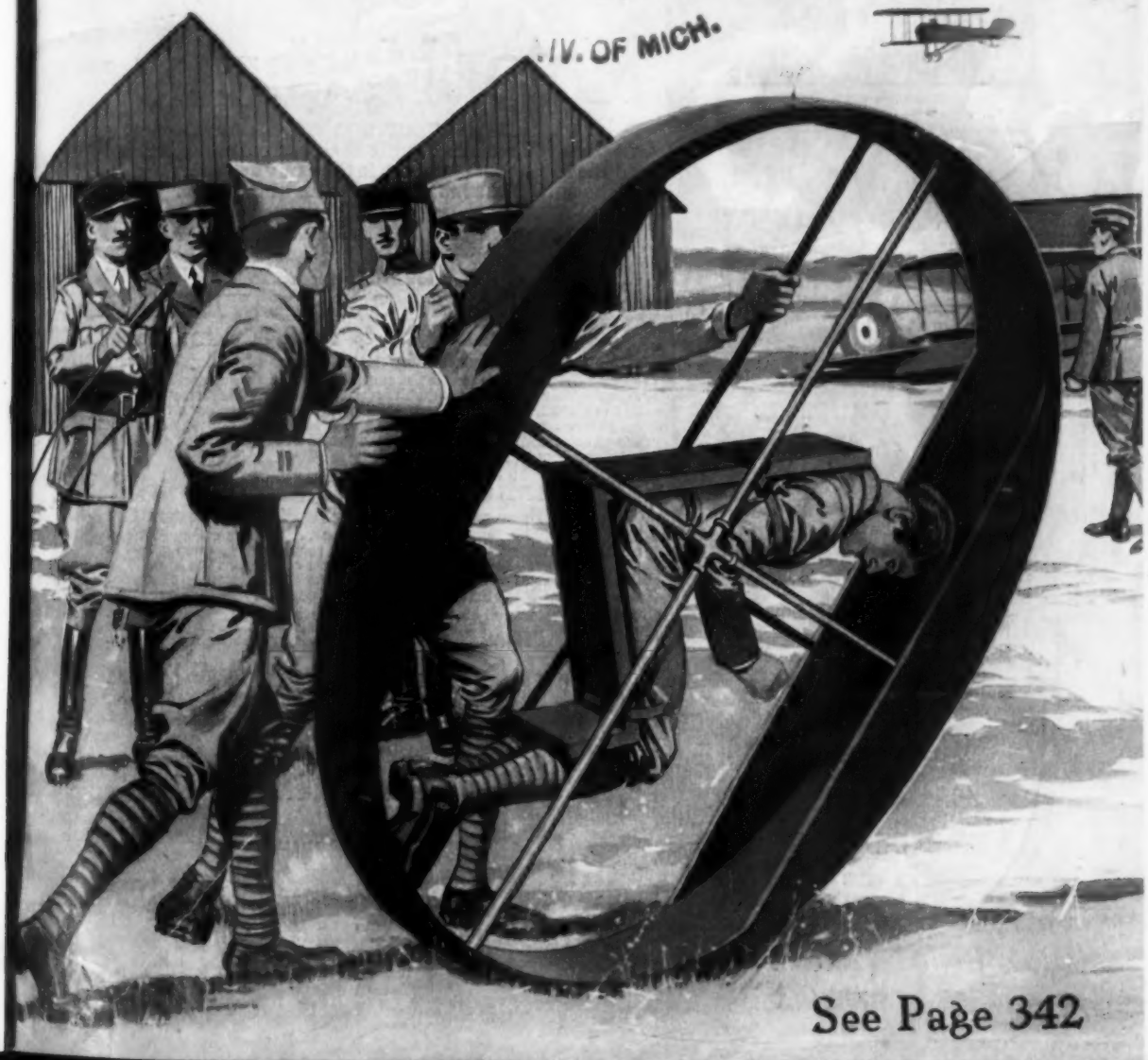

See Page 342

Main Building and Grounds of The Rahe Auto and Tractor School for Civilians, Kansas City, Mo.

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See Page 342

Popular Mechanics Magazine

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Vol. 30 SEPTEMBER, 1918 No. 3

Bowl-Shaped Land Monitor with Revolving Turret

IN line with the current tendency toward the development of "baby" tanks for auxiliary use with the big land dreadnaughts now in service, a small monitor has lately been brought to the attention of the War Department. It is a bowl-shaped contrivance on creeper treads that instantly suggests the "mushroom" machine-gun emplacements, introduced by the Germans a year or more ago, and the gun cupolas of Liège and other Belgian fortifications. The "bowl" is a revolving turret of 12-ft. diameter. It is 8 ft. in height, weighs approximately 15,000 lb., is designed for a maximum speed of about six miles an hour, and built to accommodate a crew of eight men. A scraper attached to its lower base enables it to fill shell craters and trenches and prepare the way for heavy artillery and supply trains when making an advance. Its revolving turret makes it unlike other tanks, and enables firing in any direction. The man who controls the turret is supplied with a periscope.

The Top of the Land Monitor Is a Revolving Turret That Enables Firing in Any Direction. The Machine Weighs 15,000 Pounds and Accommodates a Crew of Eight Men

PICTURE-TRANSMITTING SET CONSTRUCTIVE TOY

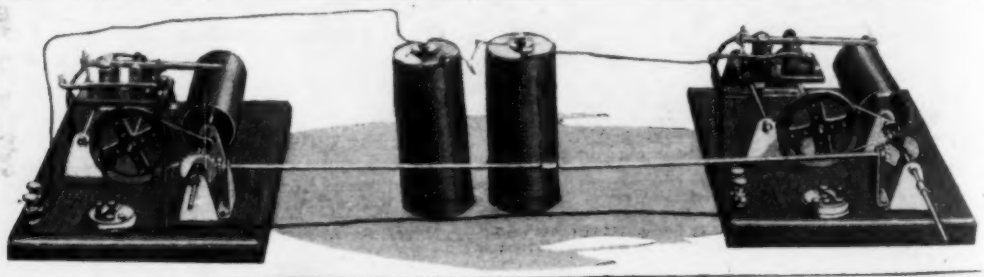
Among the latest scientific toys there is an apparatus for transmitting pictures electrically. It is based on the same principles as are applied in telephotography and might be classed as an amateur experimental outfit. Synchronism of the sending and receiving instruments is established by means of a steel shaft connecting them. It is possible, however, for another system to be employed which permits the two devices to be used at a greater range. A photograph must be reproduced on copper by a photo-engraving process before it is ready for transmission. The surface of the plate, like that of an ordinary halftone, is made up of small dots. These are insulated. The depressions between them, however, are uninsulated. The plate is rolled to fit over the platen of the sending machine, like a cylindrical record of a dictating machine. A needle held against the cylinder by a spring travels slowly from one end of it to the other as the latter is revolved. An electric current passes through the plate and into the needle when contact with bare copper is made. The circuit is broken the instant an insulated dot is encountered. Since the transmitting and receiving devices are connected electrically, the opening and closing of the circuit by the sending needle operates the recording stylus which reproduces the picture on paper at the other end of the line.

An Ingenious and Interesting Toy Apparatus has been Patterned after the Delicate Standard Instrument Shown in Use Above

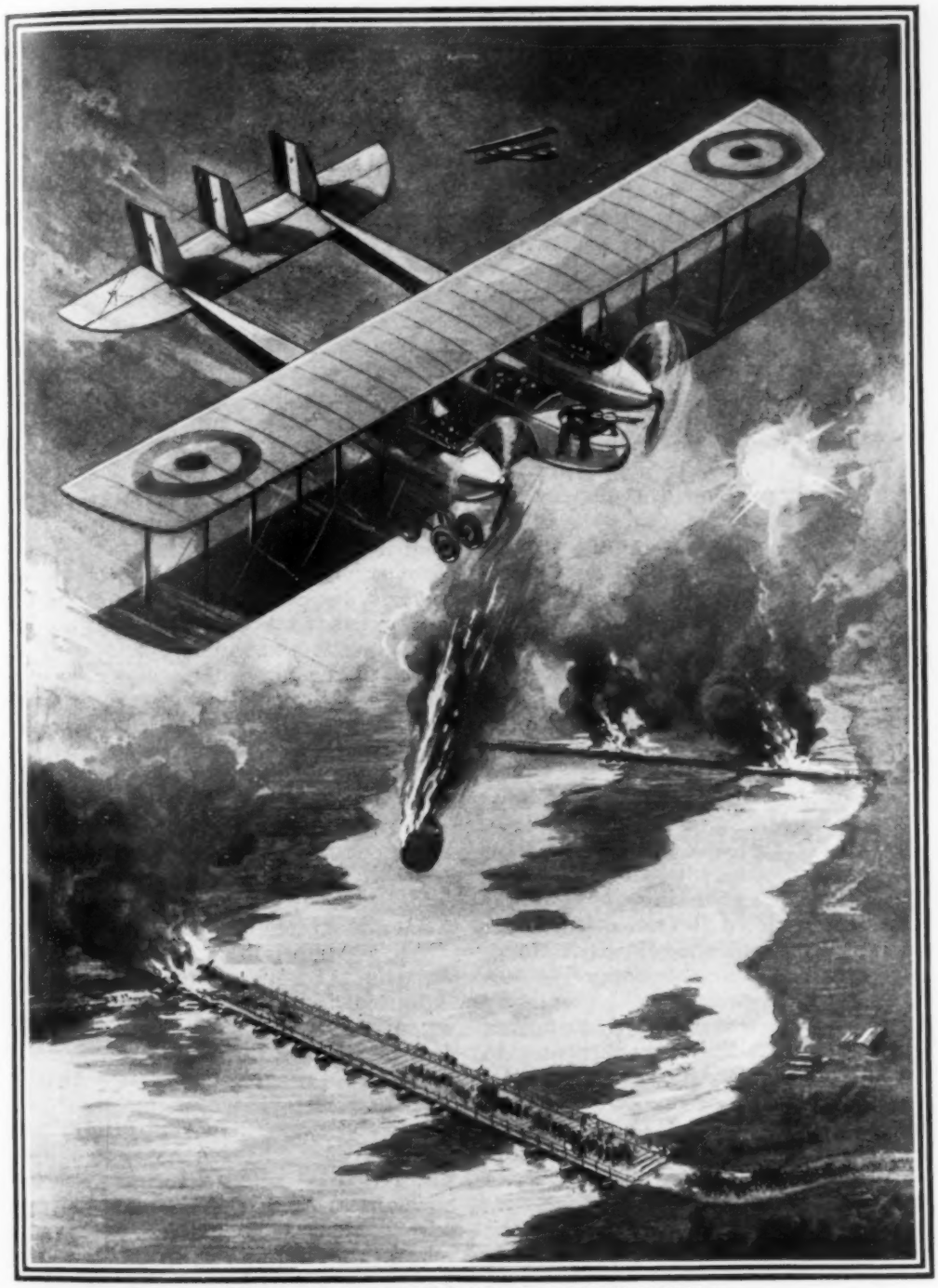
Reproduction of a Photograph Transmitted Electrically by Standard Equipment Such as That Above

GANGRENE CURE ORDERED FOR SOLDIERS

An order has recently been placed in this country for a six-months' supply of a special serum used for the prevention and cure of deadly gaseous gangrene. This order comes from the Red Cross commission in France and calls for 120,000 doses. The disease which it prevents develops within a few hours after a wound is inflicted, and if it does not receive early attention is practically sure to prove fatal. It appears that the infection develops only in wounds involving muscle tissue. The serum was discovered comparatively recently, and laboratory production is as yet somewhat limited.



The Simplified Outfit is Here Shown Synchronized by Means of a Rod That Connects the Sending and Receiving Instruments. For Longer Range Work, However, Synchronism may be Established in Another Way



AIRMEN DROP BLAZING OIL ON ENEMY BRIDGES

WITH splendid coolness and daring, airmen on the Italian front recently dropped barrels of burning oil upon bridges which the Austrians had thrown across the Piave River, preparatory to an attack. So skillful were the fliers in this new and terrifying style of bombing that 12 of the enemy's bridges were destroyed, enabling the allied infantry to administer terrible punishment to the troops caught crossing the structures.

BUILDING "EAGLE" BOATS

How Motor-Car Mechanics at De Craft to Chase

By SEARLE

This article has been passed

WHEN one has seen warships taking form like cucumbers in a hothouse, he no longer wonders whether or not America's industrial preparedness has been estimated conservatively.

There is one place in the world where such a dramatic spectacle is being enacted. It is within an enormous glass solarium on a bank of the River Rouge at Detroit where the navy's new "Eagle" boats are being built.

The American public has heard occasional mention of these vessels. The Italian government has heard much more—enough in fact for it to request that a fleet of them be built for its sea forces. Some bright morning before long a U-boat commander will gaze at the ground glass of a periscope. He will see the reflected images of some odd-looking gray submarine chasers. Possibly he will sputter: "Ach, Eagle boats. Dive!"

Deep-rooted naval traditions have been swept aside to clear the deck for men who know how to do things in a hurry. Henry Ford, maker of automobiles, has turned shipbuilder. He is doing what some other manufacturers refused to undertake. He is doing what naval contractors pronounced impossible. He is building ships as ships have never been built before, and with speed that is bewildering.

When I started to Detroit the other night I was not unmindful that standardization and mass production are Henry Ford's specialties. I was going to see how a few hundred motor-car mechanics were building, according to the popular conception, funny little boats. When I reached my destination I spent an absorbing day observing many thousand rapid-fire workmen building real fighting ships in an amazing "greenhouse."

Let there be no misunderstanding about the Eagle boat. When a landlubber thinks of a submarine chaser he is apt to visualize a hydroplane, a speedy launch, or perhaps a fast cabin cruiser. Early in the war this impression would have passed muster, for nearly all of the 57 varieties of swift sport craft were sent out by the British Admiralty to hunt Germany's steel sharks. But the Eagle is not a mere power boat. It is slightly more than 200 feet in length, about 25 feet of beam, and of all-steel construction. It is built for long cruises in all kinds of seas and is out of the launch class by several leagues.

Both in design and method of construction, the Eagle is something "new under the sun." Were it somewhat longer it might bear certain resemblance to our latest destroyers. But it is in a class by itself and therefore cannot properly be compared with older types of naval craft. No one for a moment would consider it a graceful vessel on the ways. It is not designed to be in the foreground of a naval regatta. Before launching, it is positively ugly. In the water, however, it sits well and is businesslike. And the latter, in war time or any other time, is the important consideration.

Obviously this is not the occasion for a detailed description of America's newest submarine chaser. Its tonnage, radius, power equipment, speed, and armament will all be listed in "Jane's Fighting Ships" when the kaiser's submarines are permanently submerged. For the present it is sufficient to state that the Eagle boat is a formidable craft, built for the serious business of war. It is patent that a ship that is to chase submarines, and particularly one that is to drop depth bombs without having its stern blown off, must be able to move at a respectable rate. Also it must be apparent that such a craft does not mount a 20-hp. motor, even though it be built at a well-known Detroit plant. It is permissible to mention that crude oil is burned and a steam turbine, not necessarily so powerful as those in our destroyers, installed.

IN VAST CONSERVATORY

troit **are Turning Out Seagoing German U-Boats**

HENDEE

by the Chief Naval Censor

The number of Eagle boats to be built doubtless depends somewhat upon the kaiser's naval program. Not 20, nor 50, nor 75 of them have been ordered to date, but enough to make, if placed end to end, a pontoon bridge that would afford a city man a much longer walk than he ordinarily enjoys in the course of several days. Let this suffice for the vessel itself. The way it is built and the place it is built are far more interesting.

When Mr. Ford early this year agreed to build Eagle boats at Detroit, the plans and specifications were yet to be prepared by the Navy Department, a model remained to be built and tested, the present shipyard at the River Rouge was a dream, methods of high-speed production were unformulated, important machinery demanded inventors, and special tools awaited designers. It was on February 22 that the ground was broken for the first of a series of five buildings. The largest of these, the assembly plant, a steel and glass structure 1,700 ft. long, 350 ft. wide, and about 90 ft. high, was completed the second week in May. In normal times a capable contractor might have spent a year in erecting it. But not only was it finished in 11 weeks, but finished in every detail. Work started at one end and progressed to the other. As rapidly as the uprights were raised and the steel rafters placed, the roofing was extended, the glass set, the flooring laid, and the railway tracks advanced. When 50 per cent of the work was finished, one-half of the building was ready for use. The other buildings, among them the outfitting shop, a structure 988 ft. long at the side of a pier of much greater length, were simultaneously erected.

From this it will be gleaned that fighting ships are actually being built indoors. Such a thing has never been tried before. It has the advantage of preventing weather conditions from affecting production. Its importance will be more apparent when it is known that Mr. Ford will be launching a minimum of a vessel a day before long.

From start to finish the Eagle boat is a precedent. It is being built entirely of sheet steel. No one ever heard of such a thing before. There is not a rolled beam from stem to stern, or from keel to bridge. Every part is fashioned from flat steel plates. Bulkhead angles, deck beams, channels, and other structural members are bent into shape; some, like the first-mentioned, manually, others cold-pressed by powerful machines.

Across an areaway in front of the assembly "greenhouse" are the fabricating plant, the layout shop, and the storehouse. Farther on in the open is an extensive "lumberyard" in which are arranged innumerable stacks of thin steel plates. Except for the shape of some of them, they look as if they were composed of trimmed and orderly arranged layers of rust-colored sole leather. And when one of the plates is lifted and swung through the air by a crane, or dragged from a stack by a small army of husky laborers, it bends and sways in leatherish fashion, and the similarity is all the more striking.

What then is being done? Sheets of steel are entering at one end of a long building and Eagle boats are being launched at the other end!

From the supply yard the material is taken to the layout tables, to the shears, or to the multiple punch presses. At the layout tables patterns are placed on them and the plates marked much as pieces of cloth are chalked by a tailor before they are cut. The shears cut the steel to size as if it were cardboard in a bindery. Long sheets are fed across rollers to the punches, which make rows of rivet holes with mathematical precision. At another point one sees enormous rollers bending plates to their required forms.

The plates are numbered and become definite parts of the ship. The fabricators build up certain pieces, like a bulkhead, for instance. When one of these is finished it is ready to be riveted in place. The process of construction has been reduced to the simple formula of cutting, punching, and shaping plates according to pattern; putting certain of them together to form fabricated parts, and then assembling all of them and riveting them together according to number.

As one enters the central doorway at the front of the big assembling plant, a grumbling, rumbling sound like the droning of a thousand aeroplane motors bombards his ears. While still at the threshold he is not impressed so much by the loudness of the noise as by the quantity of it. It is composed of sharp, staccato notes interspersed with terrific booms, and is unvarying in volume.

As I stood motionless for a moment and looked ahead through what is not unlike an enormous train shed of great height, my guide mentioned that 12 ships were under construction in the colossal room. Try as I might, I could not see one. We ascended a flight of steps to the executive offices on a gallery above. Suddenly, when at a height of 20 or 30 ft., I saw a gaunt keel a couple of hundred feet in front of me. Then in quick succession the hulls, all in various stages of completion, revealed themselves one after another.

Extending the full length of the assembly plant are five standard-gauge railway tracks. The two outer tracks and the central one are known as shipways. The intermediate ones are supply lines. Two other supply tracks flank the opposite walls outside of the building.

Each Eagle boat is built on a long flat car, supported on 12 standard trucks and stationed on one of the shipways. The cars are 187 ft., over all, and remind one of tremendous black centipedes. On each of the three shipway tracks there is room for seven of these cars. Thus there is place in the plant for the simultaneous assembling of 21 ships.

From the laying of the keel to the mounting of the rudder and propeller, a boat progressively occupies seven different positions along its way. That means that the assembling is divided into seven distinct operations executed by seven different crews of workmen. When the first operation is completed, the car bearing the embryo boat is moved to the second position, and a new car is brought into the vacant berth ready for the keel of another vessel to be laid. Before a boat can be transferred from the first to the second position, every other boat along the way must advance one station. This means that each of the seven operations on seven different boats must be completed on time to the minute by seven distinct crews of workmen. When the first crew is ready to lay another keel, the last crew must be ready to launch a boat. Not an inch of space has been provided for flexibility in the event of "unavoidable delays." No room has been left for failure!

As one walks through the glass-walled building, where work continues day and night without even momentary interruption, the noise becomes blinding. Hundreds of rivet "guns" and reamers and sledge hammers produce a metallic pandemonium that is deadening to the senses. From the cables of traveling cranes overhead dangle sheets of steel. These are swung into place before men working on scaffolds along the sides of the ships. Like so many billposters, they "tack" the "limp" sheets quickly in position. All along the line electric rivet heaters are glowing and red-hot rivets curving gracefully through the air like shooting stars. At one point the dazzling glare of electric-welding cabinets adds color to the animated scene. At the third position the sides of a ship are well in place. Standing some distance away and looking toward the light, the awkward hulls seem to one like gigantic colanders, so full are they of rivet holes.

When a ship is ready to be launched,

the car on which it is blocked is drawn through the rear exit of the "greenhouse" onto the rails of an electric transfer table. This moves along a series of perhaps a dozen depressed rails that extend at right angles to the shipways. The table travels in a straight line for several hundred feet, carrying the boat sidewise to the launching table. The latter is a big platform supported by four pillars of water. In other words it is a very large hydraulic elevator built over a concrete basin. When the transfer table is brought alongside and the two tracks register, the car is moved forward onto the lift. The latter descends quickly into the water. The boat floats free from its car and is towed down the slip a short distance to the outfitting pier. The elevator is raised and the car returned to the assembly plant.

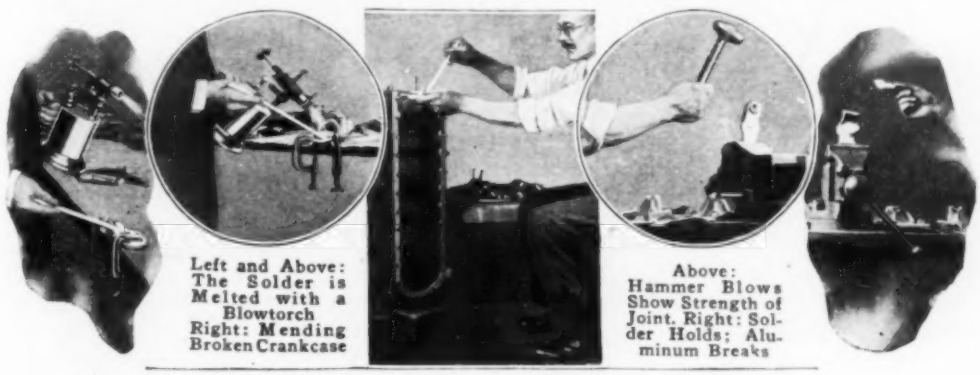
The vessels are outfitted and provisioned within view of the place they are built. Across the water from where this is done, a naval training station has been established. At it young jackies are schooled to man the Eagle boats as rapidly as they are ready for service.

When one has seen warships taking form like cucumbers in a hothouse, he is apt to think that America's industrial preparedness has been estimated conservatively.

SURPRISING SHOWING MADE WITH ALUMINUM SOLDER

Remarkable claims are made for an aluminum solder that is said to have a tensile strength of 22,000 lb. to the square inch. After exhaustive tests covering a period of two years, it is understood that a foreign government has adopted it for such highly important work as aeroplane-engine repairing. It has also successfully passed rigid tests conducted by certain American motor-car companies. In addition to being applied without the use of flux or acid, the solder is melted at 350° F. by the heat of a blowtorch. When two parts of an aluminum casting are mended by being soldered with the alloy, the joint apparently makes the piece stronger than it was originally. In support of this, tests have been made of mended pieces by placing them in vises and subjecting them to heavy hammer blows. Continued pounding has fractured the aluminum without injuring the soldered joints. In this respect a seam is much like a welded one, it is pointed out.

¶Attention has been called to the apparent fallacy of grouping soldiers according to height, for marching. It is claimed that they should be arranged with respect to the length of their legs. This system, it is contended, would obviate the needless fatigue due to men of different leg-lengths being compelled to take uniform strides.

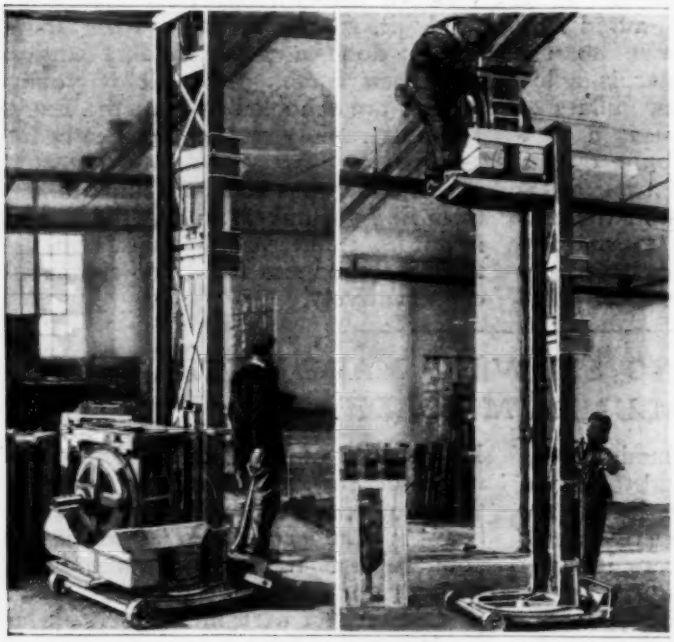


Left and Above: The Solder is Melted with a Blowtorch Right: Mending Broken Crankcase

Above: Hammer Blows Show Strength of Joint. Right: Solder Holds; Aluminum Breaks

INSTALL OVERHEAD MOTORS WITH ELEVATING DEVICE

When installing a number of overhead motors in a factory much time and labor were saved by using a portable elevator, such as is employed in piling cases and barrels in warehouses, thus doing away with the construction of platforms and scaffolding. Each motor was placed on the elevating platform and drawn to its place of installation, after which the platform was raised until the motor was brought into position where the workmen could permanently attach it to the ceiling beams. The elevator used could raise its load to a maximum height of 20 ft., if desired.



A Portable Elevating Device Employed in an Unusual Capacity: On the Left Is an Overhead Motor Mounted on Blocks on the Elevating Platform, Ready for Installation in a Factory. On the Right, the Motor is Elevated to the Ceiling and Held in Position While being Anchored

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¶While constructing a retaining wall recently, contractors employed compressed air to transport the concrete used, the material being delivered though an 8-in. pipe a distance of 1,500 feet.

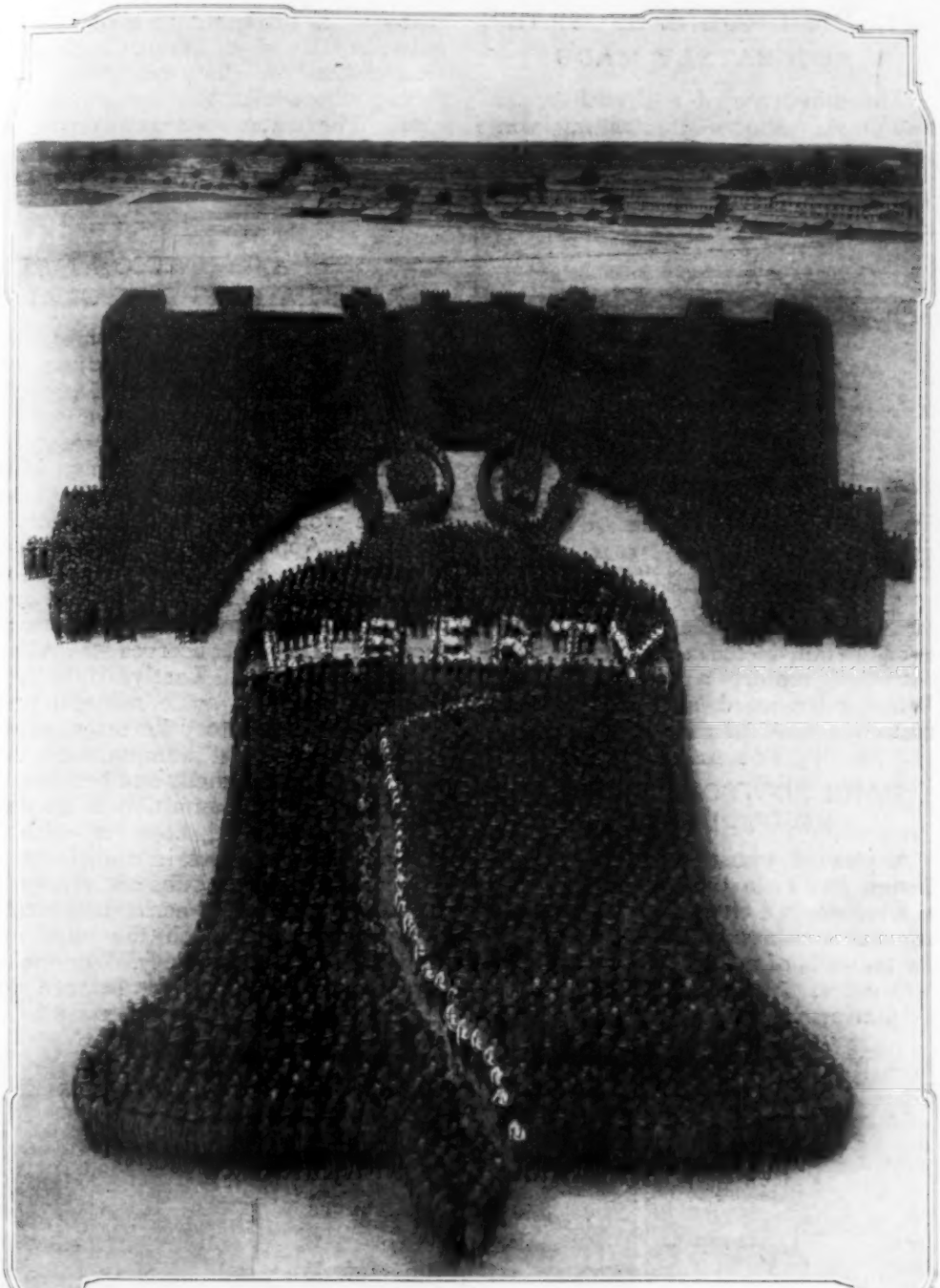
OFFICERS' TRAINING SCHOOL FOR ENGINEERS OPENED

Some 2,000 candidates for commissions as captains and first lieutenants in the Engineer Corps are to receive instruction at the new engineer officers' training camp that has just opened at Camp Humphreys, near Washington. Facilities used during the tutelage of 17,000 engineer replacement troops preparing for oversea service, are at their disposal. These consist of the usual military arrangements as well as 15 special schools for intensive instruction in mining, quarrying, gas and flame defense, barbed-wire fortifications, water supply, and railway communication. After being put through these courses, the candidates will finish their training with a course in sapper work so that, if necessary, they will be capable of commanding sapper troops. Able-bodied men between the ages of 32 and 36 years may try for commissions as lieutenants, and those between 36 and 42 years are eligible for captaincies. A traveling medical board visits large cities to examine candidates who have made application for training.

MINERS WORK ON FUNERAL DAYS TO SWELL OUTPUT

To prevent tonnage loss, collieries in anthracite-coal fields hereafter will not stop work on the funeral day of an employe who has been killed. Instead, a committee of six will attend the ceremony. Wages of these representatives will be paid, and $150 in addition to compensation allowed by law given to heirs by the company.

FIGHTING MEN FORM GREATEST LIBERTY BELL



PROBABLY never before have such interesting and impressive photographic studies in perspective been attempted as those undertaken at various training camps. This Liberty Bell is composed of 25,000 soldiers—two and one-half times as many men as composed the "living" picture of the flag photographed at the Great Lakes Naval Training Station. There are eleven times as many men in the beam as in the bell. The former is 368 ft. long at the top and measures 435 ft. from top to bottom. The bell is only 64 ft. wide at the bottom. Lining the crack and composing the bolts in the beam are men who are bareheaded. The whole figure is 880 ft. long. The picture was taken from a 75-ft. tower.

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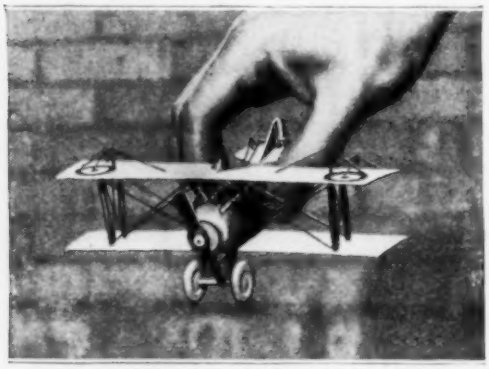
SIX-INCH MODEL OF "SPAD" ACCURATELY MADE

The miniature of a French "Spad" aeroplane, shown herewith, while measuring but 6 in. from tip to tip of its wings, is complete in practically every detail, including the eight-cylinder "V" motor, with side exhaust. Wood, pasteboard, and wire were the materials used in constructing it.



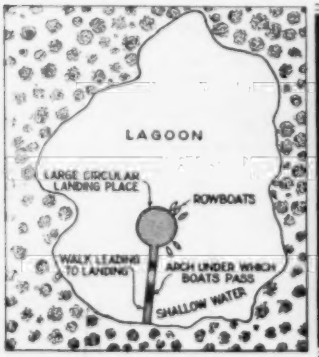
This Model of a French "Spad" is Made of Pasteboard, Wood, and Wire, and Measures But Six Inches from Tip to Tip of the Wings

PARK ROWBOAT PIER HAS NOVEL FEATURE

A pier of unusual and ornamental design has been built from the shore of a lagoon in a city park across adjoining shallow water, out to a point where the water is of more satisfactory depth for rowers. At the end is a large circular platform with landing places for as many as 25 rowboats. About midway between the ends of the pier is an artistic arch beneath which persons in small boats, who prefer shallow water, can pass. The water passageway so provided enables such rowers to avoid going out around the end of the pier and into deep water.

EARTHEN AMMUNITION MADE FOR TRAINING PURPOSES

Terra-cotta shells, aerial bombs, and hand grenades are being manufactured in large quantities for use in training our artillerymen, airmen, and grenadiers, according to unofficial information that is considered reliable. The idea of using earthen ammunition for practice work seems to be an entirely new one. Apparently there are several advantages to be derived through the adoption of the plan. Terra-cotta ammunition is cheap and quickly manufactured. Its use conserves steel to an important degree. Lastly, it is less dangerous and in some respects perhaps more satisfactory for target practice than standard ammunition. At least so far as the shells and bombs are concerned, the ammunition is nonexplosive. It is filled, however, with a fine powder that rises in a dust cloud when a shell hits a substantial object or the ground. The aerial bomber is thus enabled to watch the effect of his work without difficulty. The shells correspond in size and balance to standard high-explosive projectiles.



This Arched Pier in a City Park Lagoon Permits Rowers Afraid of Deep Water to Circumnavigate the Pond without Venturing Far from Shore. At the Left Is a Layout of the Lagoon and Pier

A Caravan of Trucks for the Quartermaster Corps, Lined Up alongside a Factory in Which They have Just been Completed, Ready for an Overland Trip to a Port of Shipment

TRAINS OF ARMY TRUCKS FOR OVERSEA FORCES

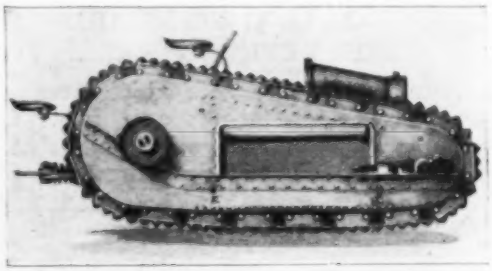
A number of America's busiest manufacturing plants are now devoting the greater part of their energy to war work. This is notably true of automobile factories, some of which are filling large orders for the army. In the yards of these establishments, and sometimes in the adjoining streets, scores of trucks frequently may be found lined up for delivery to the seaboard. Often they are driven overland to the shipping ports, thereby relieving the railways of that much freight. These long, swiftly moving caravans of trucks often will contain as many as 50 machines.

NEW DEVICE FOR SALTING WOODEN SHIPS

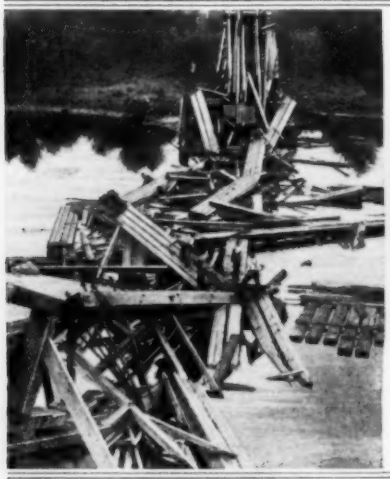
A simple device, which is operated with the aid of compressed air, is being used in more quickly placing salt between the ceiling and the planking of wooden ships—a practice followed to preserve the wood above the water line. A hole is bored in the ceiling, outside of which a salt-filled tin box is placed. Then a jet of air is forced into the box and it is quickly emptied, causing the salt to enter and fill the numerous pockets and crevices between the ribs.

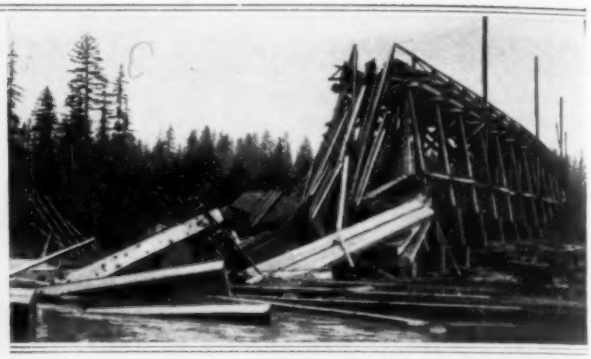
NEW FARM TRACTOR IS SEEN AS POSSIBLE WAR MACHINE

While details of its construction are for obvious reasons withheld, a new creeper-tread tractor, originally designed for agricultural purposes, has interesting claims made for it. One of its strong points is its supposed ability to negotiate uneven and hilly ground without being handicapped by difficulties arising from undue side strains. Because of this and certain other meritorious features, the tractor recently aroused the admiration of a British army officer who inspected it. The value placed on the machine by this man, who is credited with having influenced the adoption of tanks by the British army, caused its plans and specifications to be placed at the disposal of military authorities at Washington.



For Its Type and Power, the Tractor Is of Unusual Lightness. Also It is Said to Be Free from Side-Strain Troubles





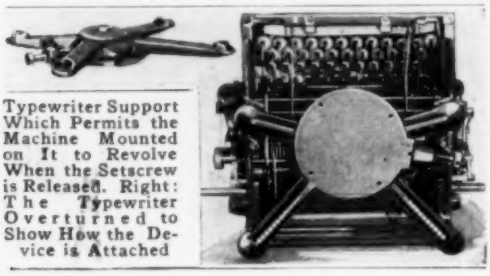
Two Views of a 220-Foot Trestle through Which Two Electric Locomotives and Two Flat Cars Plunged into 80 Feet of Water: The Span had Not been Used for Some Time. The Extent of the Collapse Indicates How Utterly Unfitted for Service the Structure Was

TWO ELECTRIC ENGINES CRASH THROUGH SPAN

When an attempt was made to send two electric locomotives and two flat cars across a wooden trestle, spanning a reservoir in the Northwest, which had been unused for some time, the structure collapsed, plunging train and crew into 80 ft. of water. Two men were drowned and a third narrowly escaped. Only short end sections of the bridge, which was 220 ft. long, remained standing after the crash. Investigation by engineers showed that the bottom chord in the center of the bridge had been a particularly weak part of the structure.

REVOLVING STANDARD FOR TYPEWRITERS

A metal standard with which a typewriter can be fastened securely to the top of a table or desk, is so made that the machine can be turned around for oiling or repairing without releasing it from its base. The support consists of a four-armed member to which the machine is clamped, and which is set in ball bearings in a disk secured to the table or desk. A setscrew holds the typewriter in a writing position.



Typewriter Support Which Permits the Machine Mounted on It to Revolve When the Setscrew is Released. Right: The Typewriter Overturned to Show How the Device is Attached

SINGLE SHOES NOW SOLD BY LONDON MERCHANTS

One of the many pathetic side lights on our war is reflected in advertisements published by British shoe merchants, which vividly impress upon one's mind the sacrifices that many of our sons, and their comrades, are gallantly making. Owing to the large number of crippled veterans of the western front, London dealers in men's footwear now sell single shoes for one-half the price of pairs. To quote an advertisement that recently appeared in a fashionable illustrated magazine: "Wartime boots at 26/3 a pair or 13/2 a boot. The single boots, rights or lefts, are for those men who have been so unfortunate as to lose a leg."

¶A wax recovered from the waste produced in extracting sugar from sugar cane is being considered for use in the manufacture of phonograph records, candles, polishes, etc., in place of carnauba wax, obtained from a species of palm.

ARTIFICIAL LIMBS REVOLUTIONIZED BY NEW SCIENCE OF SURGERY

ITALIAN surgeons in making amputations are doing their work in such a manner as to make possible utilization of the intrinsic powers of the stump. This means that a man who has lost a hand, for instance, is enabled to open and close the fingers of an artificial one by means of tendons and muscles, instead of cords and levers. Hundreds of operations of this sort have been performed with results that are truly marvelous.

The work is known as kinematization. Briefly it consists of forming at the end of a stump what is known as a "motor flap." This is covered with perfect, well-nourished skin of normal sensibility. It is built of such muscular masses, tendons, and tissues as are available, and is of such shape and dimension as to be suitable as a point of attachment for the hooks, wings, rods, or thongs to be used in transmitting movements of the muscles remaining in the stump to artificial limbs. The "motor" may be single, double, or multiple, and upon this, of course, depends its degree of usefulness. The operation calls for the preservation of the greatest possible amount of the original bone and of muscles and skin in performing the amputation, for skin flaps, tendonous and bone fragments, and muscular insertions that in ordinary practice would be considered superfluous, are of major importance in this new surgery. Since the tendon is best adapted for the transmission of muscular contrac-

Illustrating a Type of Motor Flap, to Which a Cord is Attached for Transmitting Movements to an Artificial Hand

Above is Shown a Motor Flap of Muscular Formation Applied to an Amputation Stump of the Lower Part of the Arm. At the Side is Pictured the Method Employed in forming a Skin-Lined Canal through a Flap

BY COURTESY OF THE LANCET, LONDON

The Combination of Surgical and Mechanical Skill has Enabled the Patients at Right and Left to Control Voluntary Extension of the Knee. The Pictures Show Application of Kinematization to Amputation Stumps of the Lower Third of the Thigh

tion, it is employed if possible. When it is missing, muscles must be utilized by including muscular bundles with the terminal flap, or by tunnelizing them. It is even possible to perform the operation on healed stumps. The science calls for cooperation of surgeon and mechanic and offers remarkable opportunity for assisting the war's maimed. It simplifies artificial limbs and materially increases their usefulness. On the other hand, the ability of the motor flaps to exercise their full power is entirely dependent upon the mechanic's skill in making artificial limbs that are perfectly adapted to their shape and strength.

Here Weights are being Used by a Patient for Training in the Use of a Motor Flap

Work similar to that of the Italian surgeons has been undertaken by the Germans. While the latter have performed a large number of operations of this kind, they have confined themselves to a single type of motor flap. The Italians have done broad experimenting and therefore carried their work along in a more truly scientific manner and with greater success than their imitators.

This Artificial Arm is Applied to a Stump Only 13 Inches in Length, Yet the Man Is Able to Flex the Forearm and Extend the Fingers

¶In 1917 Italian motor-vehicle makers exported cars valued at about $23,000,000—nearly four times the value of exports in the best pre-war year.

NEW LAW WORKING GREAT CHANGES IN SCHOOLS

Revolutionary changes, the extent of which it is as yet difficult to realize, have begun to take place in the public-school system of the United States. They are the result of the establishment of the Federal Board of Vocational Education by act of Congress early in 1917. In the future, public-school education is to be democratized as never before, in that it will be adapted to the need of those who must prepare to take up the common wage-earning pursuits in agriculture, industry, or commerce. Plans have already been perfected, and to a degree have been put into operation, for the employment of experts in various lines of study, and the systematic inspection of federally aided schools. The board has also approved of state plans for vocational courses in the 48 states and an allotment of money has been made.

The vocational courses in farm work were the first generally established by the states, but instruction in trade and industrial subjects and in home economics has also received hearty support from them. The Federal board has been called on to do extensive work in retraining disabled soldiers and points out that this war work will lead to larger effort in peace times in teaching persons, born crippled or disabled in industry, to earn a living. The training of tradesmen for various war industries is another important phase of the board's work at the present time.

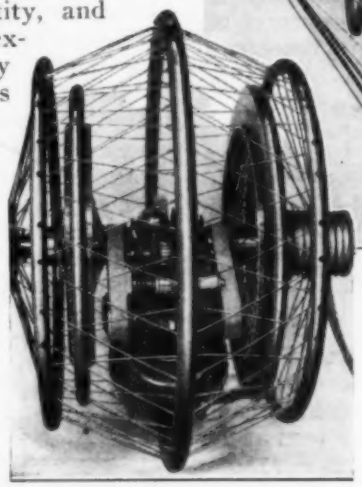
STANDARD SCREW THREADS TO BE ESTABLISHED

Congress has provided for the appointment of a commission which will establish standard screw threads for adoption in manufacturing plants under control of the War and Navy departments, and, as far as practicable, for general use in this country. Manufacturers will gain immensely by the uniformity which the commission will bring about.

PRIZE FOR GAS DEVICE FOR AUTOS OFFERED

The sum of $5,000 is offered as a prize by a British organization, the Automobile Association and Motor Union, for the best system for enabling coal gas to be used as a fuel in motor vehicles. The competition closes Dec. 31, 1918, and is open to persons in allied countries, as well as to Britishers.

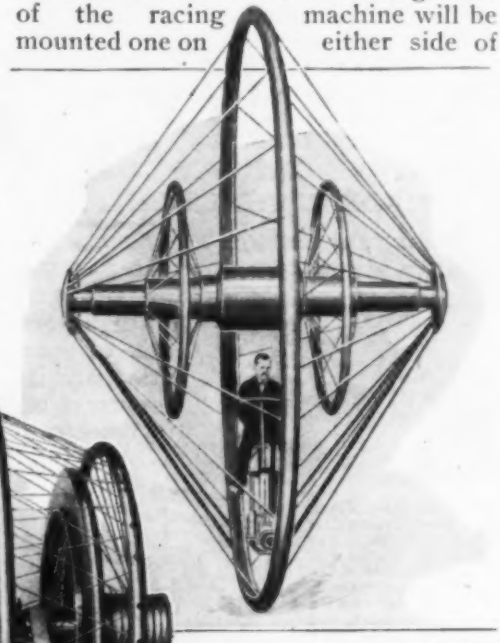
Several definite requirements are laid down for all devices eligible for entry. Among these are that the quantity of gas stored must be equivalent in propelling power to not less than 3 gal. of gasoline, while the space occupied by the gas container, or set of containers, must not exceed 19 cu. ft. for the above quantity, and the weight must not exceed 140 lb. Obviously the association desires something that will be within the reach of many, for the retail price must not be over $100, nor the charge for its rental over $20 per year. A definite limit to the cost of charging containers is also specified. Full particulars can be obtained by addressing the above association at Farnum House, Whitcomb St., London, W. C. 2, attention of the secretary.



A Model, 42 Inches High, Constructed for Test Purposes, Preliminary to Building the Larger Machine: This Wheel Weighs 600 Pounds

BIG GYROSCOPIC UNICYCLE WITH MARVELOUS SPEED

After years of experimenting with the gyroscope an inventor has begun the construction of a gyroscopic unicycle, 14 ft. high and weighing 2,000 lb., for use on speedways, which promises to attain remarkable speed, 200 miles or more per hour being the estimate of the builder. This vehicle is being constructed along lines similar to a model 42 in. high and weighing 600 lb., designed for experimental purposes. While the smaller wheel is driven by an electric motor, suspended from the axle in the cagelike framework, the larger one will be driven by an aeroplane engine hung beneath the driver's seat. The two stabilizing units of the racing machine will be mounted one on either side of the center so that they can be shifted back and forth on the axle, thereby causing the unicycle to turn to the right or left as the driver desires.



Gyroscopic Unicycle, 14 Feet High, being Built for Racing Purposes: It is to be Driven by an Aeroplane Engine and will Weigh 2,000 Pounds

In the 42-in. machine the two stabilizing units, each weighing 150 lb., are placed either side of the motor. When current is supplied to the latter, through a cord connected with the hub, they quickly attain a speed of 700 revolutions per minute. On shifting a weighted lever, power is also transmitted, by a belt, to the main axle and the mechanism begins to travel on the single, centrally located rim. So great is its stability that a man can put his whole weight on either end of the axle, extended for the purpose, without up-

setting the wheel, though the added weight will cause it to travel in a curve.

It is the well-known characteristics of the gyroscope illustrated by this and other tests that are relied on by the inventor to make the larger machine perfectly stable and subject to control in spite of the tremendous speed at which the machine is expected to travel.

LIGHT-WEIGHT TYPEWRITER MADE IN THREE UNITS

Among the features which make distinctive a new typewriter now on the market are its lightness, ease of operation, and its construction in three separate, self-contained units. The latter are the base, the action, and the carriage. The weight has been reduced to 11¾ lb. by use of aluminum and pressed steel. The ribbon feed is so actuated that the ribbon does not move when the space bar or tabulator is struck. The paper is held in place by a bar instead of by fingers, the bar requiring no adjustment for sheets of various widths. It also serves as a rule and as a tearing-off guide.

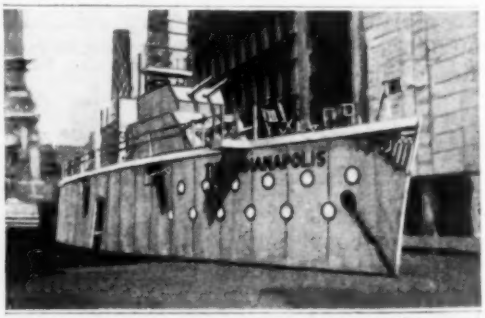
Front and Rear Views of a New Typewriter That Weighs Less Than 12 Pounds: The Machine is Made in Three Separate, Self-Contained Units, the Base, the Action, and the Carriage

JACKIES GET NEWS DAILY BY WIRELESS

By "broadcasting" wireless messages from Washington each night, the government has abolished the isolation which the crews on its fighting ships, along with those on all other vessels, have suffered from while at sea. Now each day's news is carefully sifted and condensed into 800 to 1,000 words which are ticked off at Washington on a wireless machine, operated by a perforated ribbon previously prepared for the purpose. By broadcasting is meant the sending of messages so that any vessel, battleship, or merchantman, with a properly tuned instrument, can receive it. The news items, which always aim to cover a wide field of interest, are relayed from Atlantic-coast stations for the benefit of the more distant vessels.

CITY GIVES NAME TO TWO SHIPS IN STAMP DRIVE

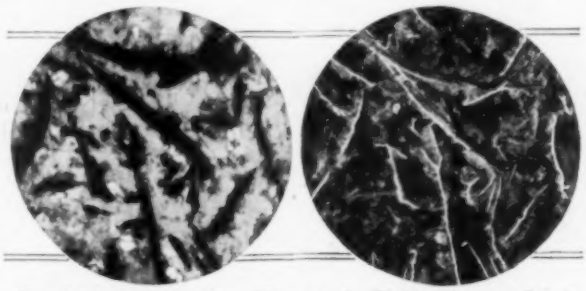
The campaign for the sale of War Savings stamps in Indianapolis was given special advertising by erecting a dummy battleship on one of that city's principal streets. The guns, two fighting masts, and other features were realistically reproduced. The campaign committee had assurance from the Emergency Fleet Corporation that if the city subscribed its quota of $5,000,000, the largest freighter to be launched July 4 at an Atlantic yard would be named "The Indianapolis." This redoubled the efforts of the stamp sellers, and on Independence Day the Indianapolis mayor, who had gone to the shipyard, was told of the success of the drive and shared in naming a 12,500-ton freighter in honor of his city. On the same day the dummy battleship in the Hoosier capital was also christened "The Indianapolis."



Dummy Battleship in the Hoosier Capital Which was Named "The Indianapolis" at the Completion of a War Savings Stamp Campaign: On the Same Day a Real Cargo Ship Received the Same Name

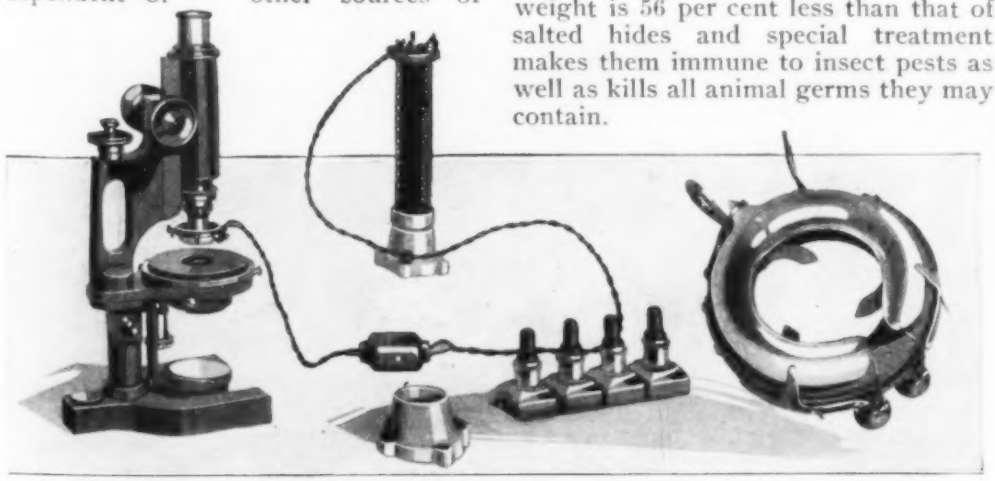
MICROSCOPE'S EFFICIENCY IMPROVED BY NEW LAMP

An electric illuminator for microscopes has recently been designed and put into use in laboratories which promises to bring about interesting developments in the microscopic study of metals as well as in other sciences largely dependent on the microscope. The essential feature of the invention, which is intended to give added efficiency to a magnifying instrument, is a small circular tube containing a tungsten filament set in a ring-like holder, which in turn is clamped to the nosepiece of the microscope and can be adjusted to produce almost any desired contrast in light.



The Lighter of the Two Microscopic Fields Shows a Specimen as It Appeared with Vertical Illumination. The Darker View, with More Details Visible, was Photographed with the Aid of the New Illuminator

The tiny lamp may be made of colorless or of blue glass, having a white reflector on its upper side. It is connected by a flexible cord with a push button and a rheostat which screws into an ordinary light socket. It makes the user of the microscope independent of other sources of light and, though his instrument is moved about, his lamp is always in position and can be adjusted at will. The apparatus has been used with success in photographing with the aid of the microscope where vertical illuminators were not altogether satisfactory. A comparison of photographs obtained by the two methods shows that those portions which appear dark under vertical illumination are light and sharply defined in the other prints.



At the Left Is a Microscope Equipped with the New Lamp Which is Connected with a Switch and Rheostat. At the Right Is an Enlarged View of the Reflector and Lamp Mounting

NEW METHOD OF PREPARING HIDES TRIED IN BRAZIL

A new process of preparing hides is being introduced in Brazil which entirely eliminates certain undesirable features now unavoidable in handling this unfinished product. Only eight days, it is said, is required to prepare the hides for shipment in a dry condition. Treated by the new process they are odorless and so are not objectional as cargo for passenger boats. Their weight is 56 per cent less than that of salted hides and special treatment makes them immune to insect pests as well as kills all animal germs they may contain.

WORLD'S BIGGEST "OLD GLORY" IS UNFURLED.

THIS immense flag—the biggest "Old Glory" that ever waved in the breeze, according to the makers whose claim probably will stand without dispute—was completed by a large tailoring house recently and unfurled in Chicago July 3. It measures 160 by 80 ft. and when in place covers the entire side and part of the end of the seven-story building in which it was made. The 1,300, and more, yards of cloth used in fashioning it weigh 750 lb. It is a rather remarkable fact that only five hours and 17 minutes were occupied in making this flag, approximately 500 employes working on it all or part of that time. All of the steps in assembling the stripes and stars were carefully planned in advance. The greatest number simultaneously working on the banner was 221 persons.

COURTESY OF THE

COVERING SIDE OF SEVEN-STORY BUILDING

Rolling Up the Huge Banner: It Was in No Disrespectful Spirit That This Flag was Laid on the Ground—an Act Usually Not Sanctioned by Flag Courtesy—but Because of Its Great Size This Was the Only Way to Handle the Emblem, Preparatory to Folding It Properly. About 100 Men were Employed in the Task

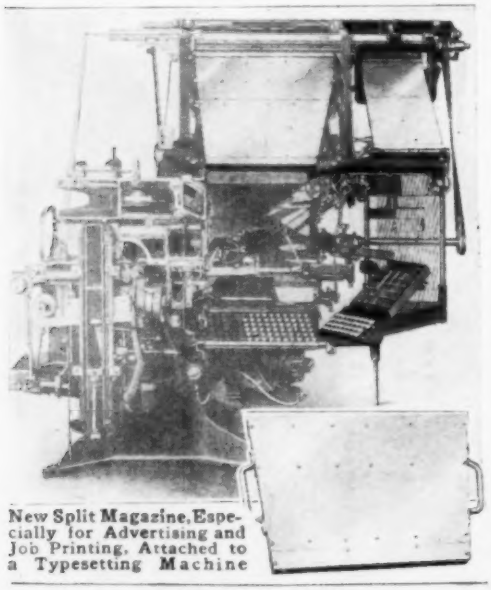
Above Is One of the Stars of the Mammoth Flag, Measuring Five Feet between the Points Indicated by the Young Woman's Hands: The Pattern for the Stars and Some of the 500 Employes Engaged in Sewing Them on the Blue Field and in Sewing the Stripes Together, are Shown on the Opposite Page. A Feature of the Unfurling Was the Singing of "The Star Spangled Banner" by the Operatives

Each Stripe Measures Six Feet Wide, as is Indicated Above by One of the Makers Who is Holding a Yardstick

The Top Timber on This Load Is a Giant Flagstaff, 165 Feet Long and Weighing 12 Tons, Cut from a Fir Atlantic, It Was Necessary to Provide Special

SPLIT MAGAZINE INCREASES RANGE OF TYPE MACHINE

To increase the flexibility of a certain make of typesetting machine, a split magazine of interesting character has been developed as an attachment. It enables a broad range of miscellaneous work to be done without necessi-



New Split Magazine, Especially for Advertising and Job Printing, Attached to a Typesetting Machine

tating the purchase of costly standard machines and sets of matrices. Its interchangeability makes it of especial value in composing rooms where there are frequent demands for changes of type faces. Particularly is it suited for advertising and job printing. Four font schemes have been arranged to be used in the magazine. The first has 792 matrices for one letter, below 14-point; the second, the same number of matrices for two letters, Roman with italics and small caps; the third, same number of matrices for two letters, Roman with black face, and the fourth, 683 matrices for one letter, 18-point and larger.

GERMANS MAKE SOLDER HAVING LITTLE TIN

Owing to the scarcity of tin in Germany, efforts have been made to produce a solder containing none of that metal. What is pronounced an excellent substitute was made from 80 per cent lead, plus cadmium and tin, but it could not be used in sealing food cans because the lead, in contact with acids in fruits, produces salts that are poisonous. More recently, it is said, a nonpoisonous solder has been obtained by combining bismuth and cadmium, both of which metals are found in Germany, with other metals not revealed.

¶That the jam industry in the Antipodes has been greatly stimulated by the war was recently indicated by the arrival in a Pacific port of a 5,000-ton cargo of this popular delicacy, to be shipped across the continent and then to the front.

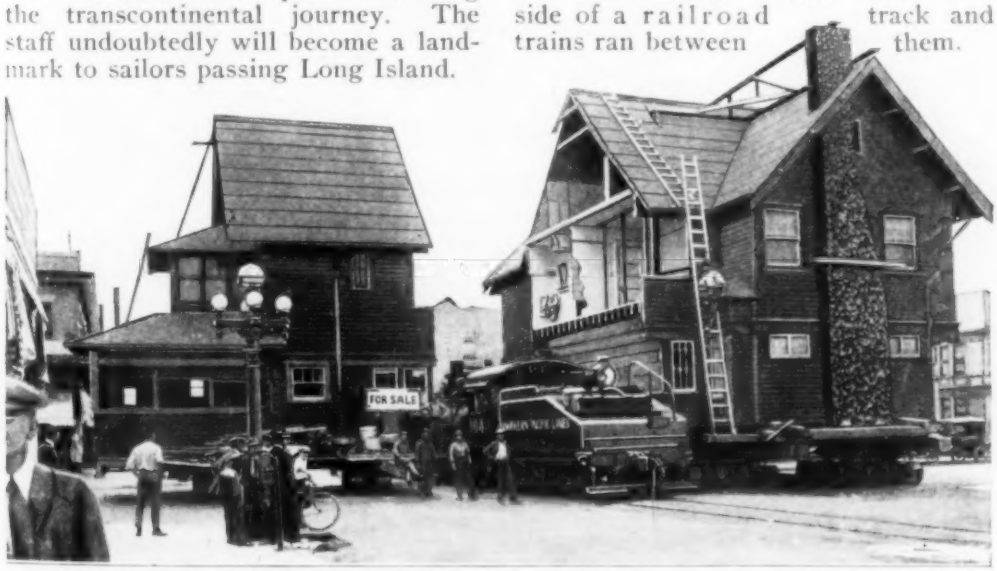
NOLAND, TACOMA
300 Feet Long. That This Long Spar might Round the Rail Curves on Its Journey from the Pacific to the Underpinning and Swiveled Supports for It

GIANT FLAGSTAFF SHIPPED ON FOUR FLAT CARS

One of the longest objects ever shipped by rail across the American continent is a wooden flagstaff which was fashioned on the Pacific coast and set up on an estate on Long Island. The pole measures 165 ft. long, is 28 in. in diameter at the butt, and weighs 12 tons. It was cut from a giant fir 300 ft. tall. Loaded for shipment it stretched over four flat cars, and in order that curves might be rounded properly, special underpinning and swiveled supports had to be provided. Six weeks were occupied in making the transcontinental journey. The staff undoubtedly will become a landmark to sailors passing Long Island.

BIG HOUSE, SPLIT IN TWO, MOVED MANY BLOCKS

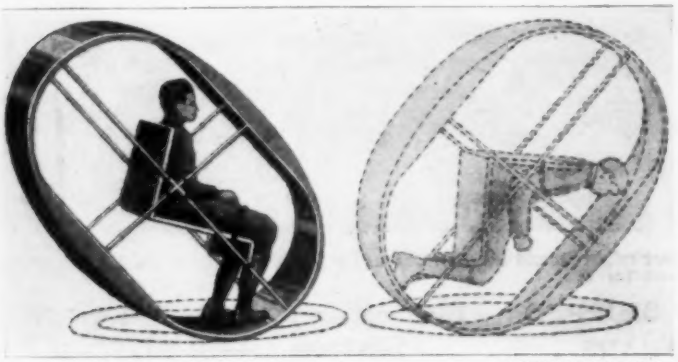
A recent undertaking which taxed the resources of the contractor, was the moving of a fine residence, weighing 185 tons, a distance of 27 blocks, in a Pacific coast city. A brick porch and balustrade and an outside brick chimney were kept intact during the transfer. The structure being 60 ft. long and 45 ft. wide, it was necessary to cut it in two, and because of its height trolley, telephone, electric, and police-signal wires had to be restrung to let the building pass. At one time the two sections stood on either side of a railroad track and trains ran between them.



The Two Parts of a Dwelling, Weighing 185 Tons, being Moved 27 Blocks through a Pacific Coast City

TUMBLING CHAIR PREPARES NOVICE AIRMEN

Among the mechanical aids that have been developed to assist in the training of aerial pilots, there is a contrivance that accustoms a novice to the sensations of aeronautical somersaults. It is an oval-shaped device with a seat at the middle point to which a student airman is strapped. When the apparatus is pushed end over end, the occupant gets the effect of looping the loop and doing tumblebug capers all in one. After two or three weeks of practice, it is said that a man who is suited for aerial gymnastics is able to go aloft and perform acrobatic feats without experiencing unpleasant sensations.

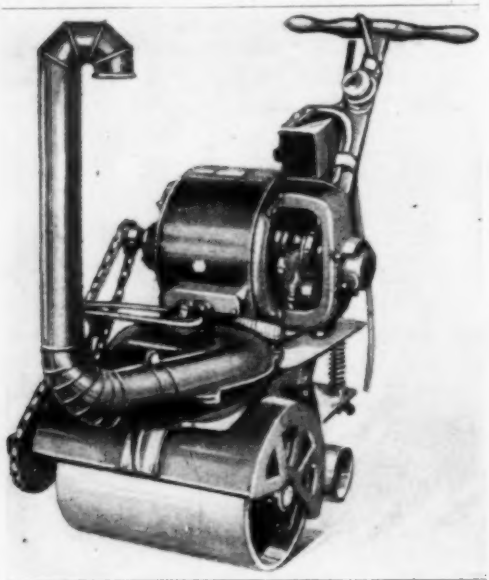


BY COURTESY OF JE SAIS TOUT

When Pushed End over End, the Tumbling Chair Gives Its Occupant Most of the Topsy-Turvy Sensations Produced by Aerial Gymnastics, Such as Looping the Loop and Tail Spins

ELECTRIC SURFACER MAKES FLOOR FINISHING EASY

With a new electrically driven surfacing machine now on the market either new or old floors can be surfaced at the rate of 6,000 sq. ft. in eight hours, no special skill being required by the operator. The surfacing is done by a chain-driven roller, 12 in. long, a 1-hp. motor mounted behind it supplying the power. A special clamping device is provided for quickly fastening sandpaper to the roller and in case polishing is to be done a covering of Brussels carpet is substituted for the sandpaper. A fan beneath a hood draws off all dust into a bag hung above the roller.



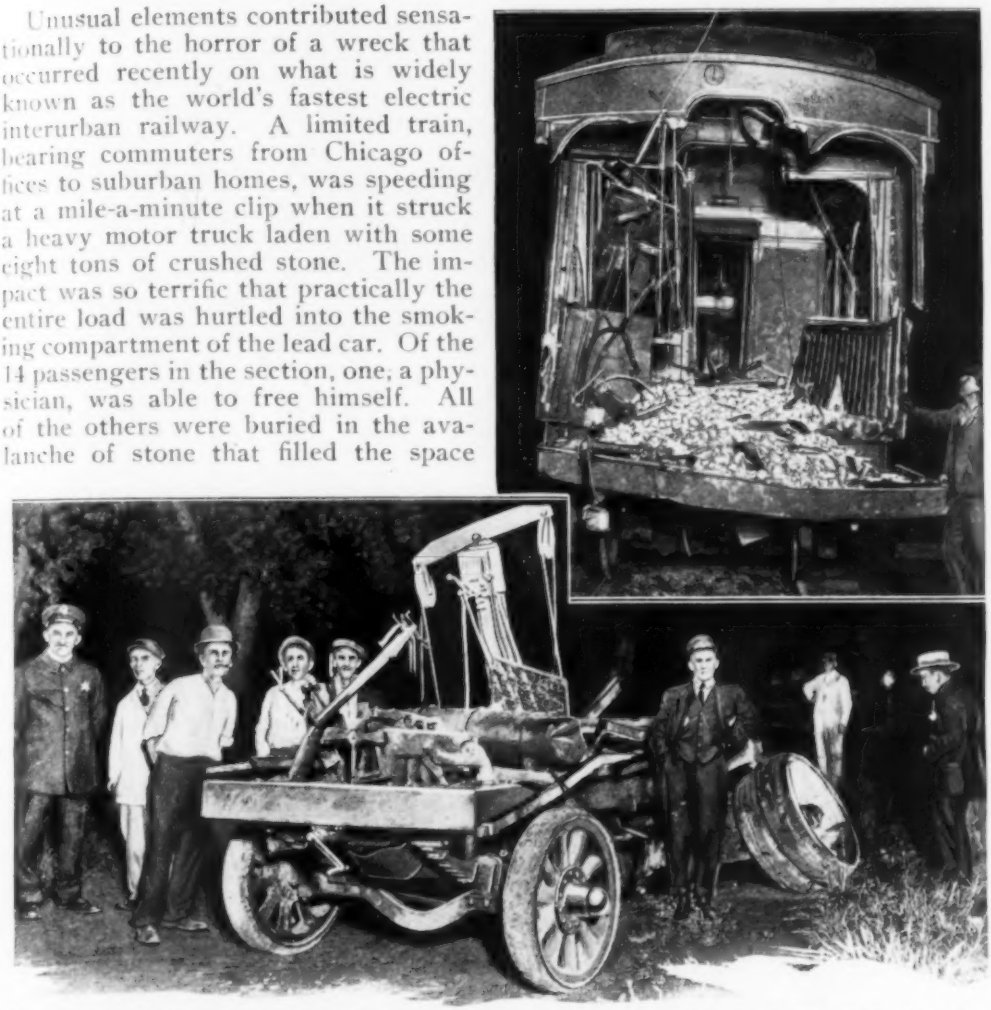
A Motor-Driven Floor-Surfacing and Polishing Machine Which Works Rapidly and Requires No Special Skill to Operate

NEW LARD SUBSTITUTE FROM FISH OIL

By treating fish oil with hydrogen a chemist has produced an oil, and also a solid substance very much resembling lard, which is entirely tasteless and when used in pastry or bread produces most satisfactory results, according to a demonstrator employed by the Bureau of Fisheries. The new product is to be placed on the market and it is the hope of the Food Administration that it will prove acceptable. Special value attaches to any process which, like the one referred to, makes available a fat obtained from sources heretofore unutilized.

WRECK VICTIMS ARE BURIED BY STRANGE AVALANCHE

Unusual elements contributed sensationally to the horror of a wreck that occurred recently on what is widely known as the world's fastest electric interurban railway. A limited train, bearing commuters from Chicago offices to suburban homes, was speeding at a mile-a-minute clip when it struck a heavy motor truck laden with some eight tons of crushed stone. The impact was so terrific that practically the entire load was hurtled into the smoking compartment of the lead car. Of the 14 passengers in the section, one, a physician, was able to free himself. All of the others were buried in the avalanche of stone that filled the space



Top: Front-End View of the Interurban Car, After It had been Returned to the Track and Much of the Stone Removed from the Smoking Compartment Visible Within. Bottom: Appearance of the Truck Chassis after being Swept along the Right of Way Several Hundred Feet by the Derailed Speeding Train

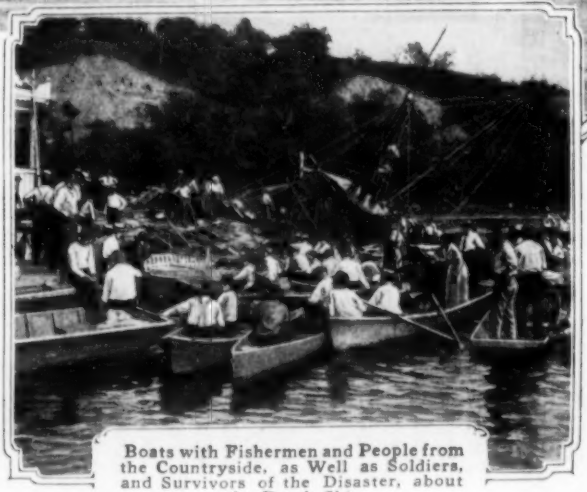
level with the window sills. Legs and arms were visible here and there, but the head of only one man was in sight, and he was covered to his throat and held immovably. The door in the partition dividing the car was wedged. To allow some of the stone to escape, the physician seized an ax and smashed the door and part of the partition. Then he began pulling legs and arms and dragging limp forms from the mass of stone. Four persons had been killed, one by smothering, and two others so seriously injured that they have since died. One or two of the remainder are still at the point of death. The front vestibule of the car was entirely demolished.

¶The first steel ship having no rivets was launched recently in England. Its plates were fused by electric welding, one of the new time-saving processes which is being experimented with in America, also, and which may tremendously speed up shipbuilding.

The River Tragedy Occurred during the Darkness of Early Morning. For Many Hours Thereafter Rescue Parties Searched for the Bodies

DEATH TAKES COMMAND OF EXCURSION BOAT

THREE score and more of youthful dancers and merry-makers went to their death in the muddy waters of the Illinois River when the "Columbia," an old excursion boat, sank in midstream at a point midway between Peoria and Pekin. In a dense fog the craft ran aground and tore a hole in its hull. It was floated quickly before the damage was discovered. Reaching the middle of the channel, it dropped like a rock to the bottom. Only the top of the superstructure, as shown above, remained above the surface.

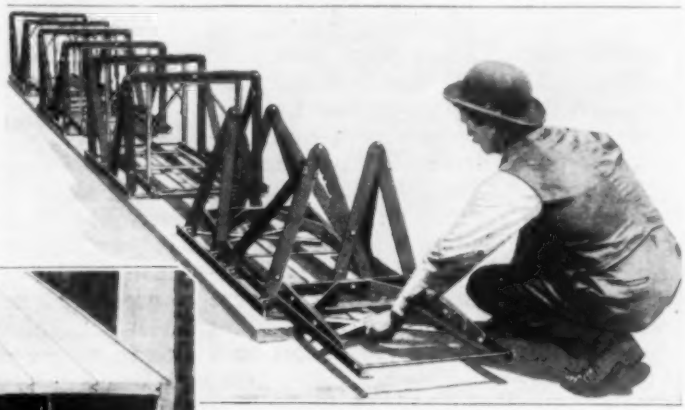


Boats with Fishermen and People from the Countryside, as Well as Soldiers, and Survivors of the Disaster, about the Death Ship

STEEL FRAMES FACILITATE CONCRETE-CULVERT WORK

To expedite the construction and reduce the cost of concrete culverts, a collapsible steel frame has been introduced which is capable of many adjustments of height and width. The contrivance is made of angles and bars, and when erected, forms a support for planks placed around it, thereby saving the time and expense ordinarily spent in building forms. Because of its arrangement, one man is able to erect or collapse it without assistance. Tar paper is laid over the forms before the concrete is poured, so that the planks and the supporting frame are kept clean. When the latter is removed, the boards may be taken out quickly. Wires are attached to the cross rod and center bar of the frame to facilitate removal when culverts, too small for a man to enter, are built.

The Device in Service, Supporting Tongue-and-Groove Planks



Above is Shown How the Frame may be Collapsed for Withdrawal from a Culvert After Concrete has Hardened

PLAGUE-FIGHTING STEAMER IN HARBOR AT STETTIN

German medical authorities have caused the construction and equipment of an interesting disinfecting boat for harbor service at Stettin. As is well known even to laymen, the problem of killing rats, fleas, and dangerous bacteria aboard plague-ridden vessels is a difficult one. It is for this character of work that the sanitation craft, a steam-propelled 100-footer, has been developed. It is supplied with both a carbon-monoxide and a sulphur-dioxide generating plant and uses the two gases separately, or in combination, as conditions dictate. Carbon monoxide is effective in exterminatng rats and mice, but does not kill fleas or bacteria. It has the advantage, however, of not injuring grain cargoes. Sulphur dioxide, on the other hand, kills everything even to the extent of depriving grain of its powers of germination. For this latter reason its use is restricted.

WAR CLOCK HAS PROPELLER HUB FOR ITS CASE

Quite an odd memento of the war is a clock case possessed by a westerner. The case is made of the hub portion of an aeroplane propeller taken from a machine that was wrecked in England after doing service at the front in France. The original stampings in the wood have been left uneffaced, and the eight bolt holes are plugged with rifle cartridges.

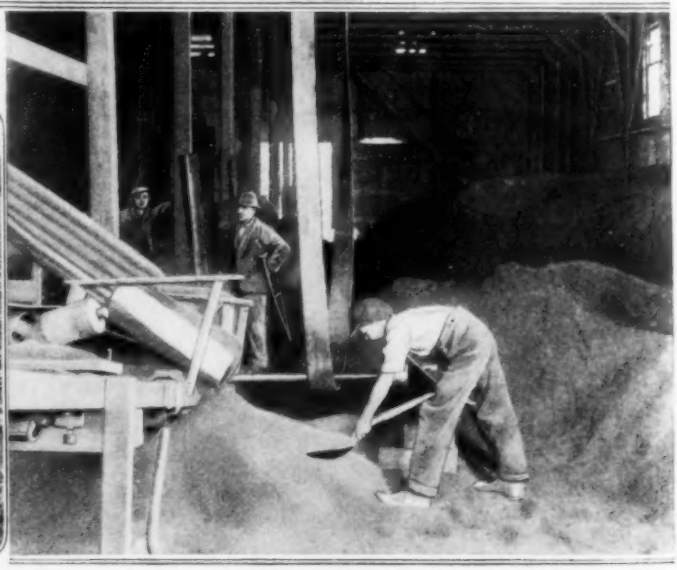
VAST PEAT DEPOSIT USED TO ENRICH SOIL

On bottom lands to the east of the Mississippi River in Illinois is a peat deposit covering thousands of acres, which is being profitably utilized in a novel way. The original plan with respect to this land was to market the peat, and a plant was erected for that purpose. But it was found impractical to prepare the fuel for commercial uses because of the cost of the work. At about the same time the manager of the factory planted a portion of the land to garden truck and was astonished at the prolific yield, half an acre producing 400 bu. of onions, and other plots yielding different vegetables on a similar scale.

Examination showed that the soil possessed splendid enriching properties, the land at one time having been the bottom of the Mississippi. In the course of centuries a vegetable deposit had been made, varying in thickness from 10 to 30 feet. It was decided to utilize the peat plant in preparing this deposit for the market, and now tons of it are being turned out and sold at a low figure. The ground being worked up consists of a tract of some 3,000 acres. The peat is excavated along the banks of a small canal and allowed to dry a day or two, and is then hauled to the factory and placed in a compost pile for several days, to cure. The next step is to place it in a 6-ft. revolving cylinder heated to a temperature of 1,700° F., in which it is dried in 30 minutes. Freed of moisture, the peat is ground and passed through a 36-mesh screen. It is then ready for shipment.

In addition to being used to fertilize the soil, this powdered peat serves as an excellent ingredient in prepared stock foods, particularly those containing molasses, as it prevents the meal from becoming sticky.

Above: The Excavator Used along the Bank of a Narrow Canal in Removing the Peat to be Dried and Sifted. Note the Creeper Treads



Left: A Half-Acre Tract Which Yielded 400 Bushels of Onions. Right: The Finished Product as It Comes from the Screens, Ready for the Market as a Soil Enricher

Off on Short Notice to the Scene of a Forest Fire: Rangers, Pack Animals, and Equipment being Transported by Motor Truck

FOREST RANGERS USE TRUCK WHEN FIRE ALARM SOUNDS

Quick action is just as vital in fighting forest fires as it is in combating flames that threaten the destruction of city buildings. Cognizance of this fact has been taken by the supervisor of the Crater National Forest in southern Oregon. At headquarters a motor truck is maintained that, when an alarm is sounded, transports rangers, pack animals, and fire-fighting equipment to a point as near their destination as existing roads permit. When such a place is reached, the machine is abandoned and the pack train takes the shortest trail available. In this way much valuable time is saved so that fires are frequently reached while still in their incipient stage.

ABLE BLIND TYPIST USES DICTATING MACHINE

In view of the preparations now being made to train blind soldiers for profitable employment, special interest attaches to the success of a blind girl typist in a large merchandizing house. This young woman has been blind a number of years but completed two years of the high-school course, nevertheless, and then applied to the concern referred to, for work. On being subjected to the firm's regular tests for typists, her good performance won her a position. All matter which she transcribes is taken by her from a phonographic dictating machine. While a little slow in acquiring facility, she now does the same amount of work as her associates and quite as accurately.

CAT'S-EYE MIRRORS SHINE IN PARIS' DARK STREETS

Paris is a city of darkness at nighttime. Pedestrians find their way through its narrow, romantic streets, and along its magnificent boulevards, with the aid of flashlights. And to assist in piloting them, a most novel scheme has been adopted. The entrances of buildings are festooned with cat's-eye mirrors, lamp-posts are belted with them; they mark places of refuge, and outline house numbers. When these metal-coated reflectors catch the gleam of a pocket lamp, they reflect rays of light and thereby aid one in reaching his destination.

MOUNTAIN ROAD CONTROLS REDUCE MOTOR ACCIDENTS

BECAUSE of the appalling number of fatal motor accidents on the various mountain roads of the state, the highway commission of California has instituted a system of controls which have greatly reduced the number of such accidents as well as the dangers of traveling these roads.

The mountain highways, for the most part, are blasted through the solid rock of perpendicular mountain walls. They wind about with curves so sharp and grades so steep that only machines working at their best and handled by the most competent drivers are able to travel with any degree of safety. The slightest mishap may mean a plunge over the precipice to the rocks, hundreds or even thousands of feet below.

The Lower Control on a Dangerous Piece of Mountain (Santa Ana Cañon): The Officer is Seen Here Inspecting the Tires of a Motorcycle

There are few places on these roads where two machines are able to pass, and for this reason, before the controls were established, accidents were unavoidable. A car ascending and another descending would meet on a sharp curve, and even if a collision was averted, it became necessary for one machine to back perhaps a mile or two along the cliff until a turnout would be reached. In attempting this, many backed over the ledge or got so near the edge that the ground caved away, and the car with its occupants would be dashed to pieces on the rocks below. The control system has changed all this.

The controls are nothing more than road stations, with officers in charge, located at the top and bottom of all the dangerous mountain routes.

Each of the controls is provided with a gate, or rope, with which the highway may be opened or closed at will. At specified hours, the lower control is opened and traffic is permitted to proceed upward. When the lower control is open, the one at the top is closed to descending traffic and only ascending vehicles are allowed to pass through. All machines are checked through the controls by which they enter and the officer in charge advises the officer at the other control by telephone just what cars have gone through. The trip through the controls must be made in a specified number of hours, and if any

Scene on Part of a Mountain Control Road: Only a Motorcycle can Pass Another Vehicle. A Continuation of This Road Is Visible in the Valley Far Below

The Lower Control on the Mill Creek Cañon Road: The Gate is Operated from the Control House Which is Seen in the Background at the Right. The Gate Closes the Highway to Ascending Traffic and Diverts It to the Control House Where All Machines are Inspected for Mechanical Imperfections

machine entering one control fails to appear at the next, the officer in charge notifies all drivers to be on the lookout for it when that end is again open to traffic. A car which breaks down between the controls must coast down the grade to the nearest turn-out, and park there until repairs can be made. Such a car is not permitted to proceed until traffic is again moving in the direction of its destination.

By this system the dangers of machines meeting on sharp curves or on precipices where they cannot pass are wholly eliminated. The effect of the controls is even farther-reaching. It is the duty of the control officer to inspect every machine before it is allowed to pass through the control. Special attention is given to the brakes, tires, and motor. Any machine which bears evidence of mechanical defect, which has old or worn-out tires, or otherwise appears to be incapable of making the trip, is immediately held up. Such a machine must either turn back or be so repaired that, in the judgment of the control officer, it will be able to make the trip without danger of breaking down. Accidents have been reduced to a negligible number since the institution of the mountain-road control system.

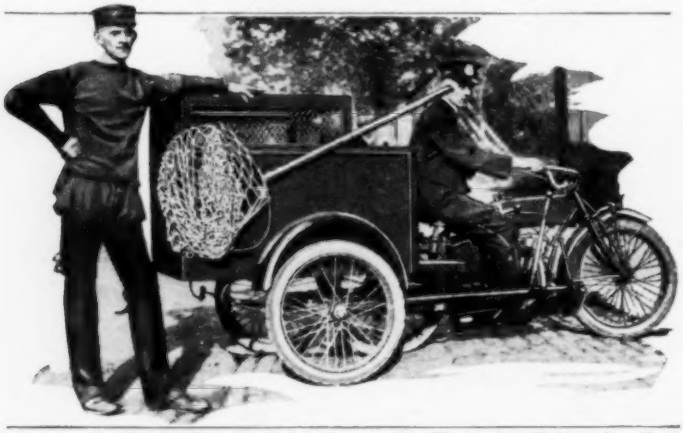
Turn-Outs in the Mountain Control Roads are All Numbered for Convenience in Designating Them, and the Distances to the Next Turn-Outs, Up and Down, are Given

THREE MILLION SPANGLES WOVEN INTO FLAG

A flag of extraordinary beauty, composed entirely of spangles, was recently displayed in a Chicago store window. The brilliant emblem, flashing back the light from innumerable points, extended almost the full width of the panel at the back of the display area. Three and one-half million of the tiny metal disks, strung on threads, were used in fashioning this flag.

MOTORCYCLE-DRAWN OUTFIT FOR DOG CATCHER

One of the newest uses to which a motorcycle has been put is as the power unit for a dog-catcher's outfit. The police of Louisville, Ky., are now using such equipment, a two-wheel car containing a cage, being drawn by a motorcycle. Accompanying the outfit on dog-hunting expeditions is a driver and a man who employs a long-handled net to capture the stray animals. The dog catcher is usually attired in a special suit of leather including leggings that reach the hips, and long wristlets.



Motorcycle Outfit Equipped by Louisville, Kentucky, Police for Dog Catching, Is Faster and More Easily Handled Than a Horse-Drawn Vehicle. The Novel Costume of the Catcher at the Left Is Largely of Leather and So Impervious to Dog Bites

PARCELS FOR OUR SOLDIERS FIGHTING OVERSEAS

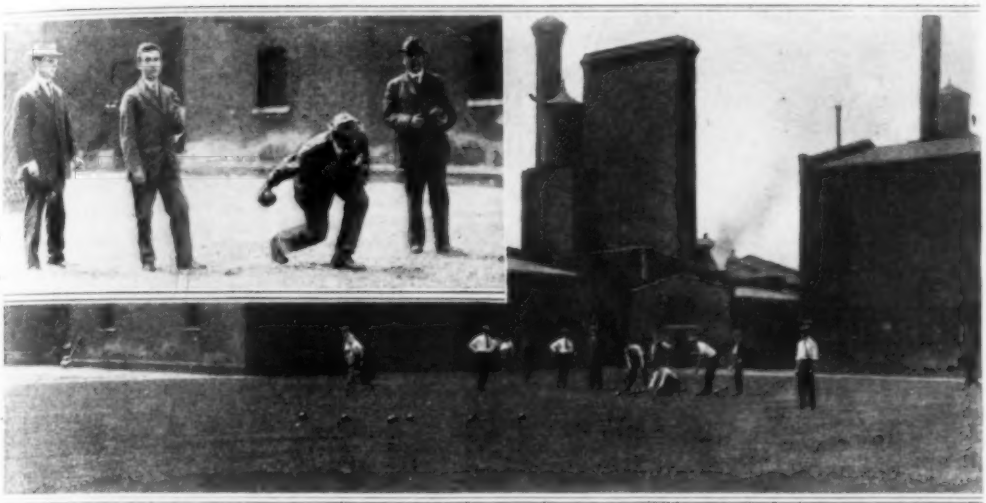
When one considers it from the standpoint of tons and ships, the government's order restricting the dispatch of packages to soldiers in Europe seems most reasonable. Secretary Baker has said that over a million of our boys are in France. Were the relatives and friends of these fighters to send each one package a month amounting only to 7 lb. in weight, the bulk would aggregate 3,500 tons. The total dead-weight carrying capacity of the recently launched concrete freighter "Faith," for example, is 5,000 tons. Thus 7-lb. parcels to each of our soldiers would fill seven-tenths of the cargo space of the "Faith" each month, and under prevailing conditions it is not reasonable to suppose that the ship could make the round trip in 30 days. In normal times this would be inconsequential. In war time, and particularly at present when England and France are making sacrifices in order to facilitate the transportation of our soldiers and material to the battle fields, one ship, or seven-tenths of a ship, means a good deal.

There seems to be a popular confusion regarding shipments of this kind. Indorsement of a signature, or the initials of a lieutenant or other officer together with the letters "OK" on a soldier's letter, merely indicate that the content has been censored and passed. It does not mean that approval is given of requests the message may contain for articles. Such requests must be approved separately by one of the soldier's regimental officers, or one of higher command. Permission granted by an officer ranking lower than a major is not sufficient. In such cases the matter should be presented by the recipient of the letter, to the adjutant general at Washington, who has the right to approve requests considered proper.

ANCIENT GAME DEVELOPS TEAMWORK IN FACTORY

It is seldom indeed that one finds a bowling green in the United States. Several splendid ones, however, are maintained on the grounds of a Chicago factory in the midst of a big industrial district where grass plots are as rare as desert oases and as refreshing when encountered.

At noontime each day, during the seasonal months, members of the office force and department heads of the fac-



General View of Bowling Greens during Progress of Noon-Day Game: Above Is a Close-Up Picture of One of the Teams. Here a Spirit of Friendly Rivalry is Generated and Its Influence Transmitted to Factory and Office

tory bowl. The errand boy may be captain of the team on which the president of the firm is the star player, or it may be the other way around.

It is now four years since the game, aside from archery the oldest surviving British outdoor sport, was introduced by one of the company's executives. In that time it has become an invaluable asset and has eliminated friction and established coördination among the employes. Office and factory men are situated in different buildings. Their work interlocks and they are continually in telephonic communication. This condition, at one time, was the cause of frequent misunderstandings and therefore coöperation was more talked about than practiced. There was no common ground on which men and women, from the chief executive down, could meet and grow to understand each other. The bowling greens have wrought a change. They are democratic playgrounds where the ethics of good sportsmanship are observed. There a spirit of friendly rivalry is generated and its influence transmitted to factory and office.

The company bore the initial expense of preparing the greens. The cost of maintenance is defrayed by dues, amounting to a few cents a month, paid into the treasury of the employes' sports and pastimes association. Each fall the office and factory, by secret ballot, pick teams to represent them in a five-game silver-cup tournament.

FIRE EXTINGUISHER OF NEW DESIGN

A new type of fire extinguisher now being manufactured can be put into operation merely by turning a winged thumbscrew, and by this means also the size of the stream played on the fire can be accurately controlled. The extinguishing liquid, together with compressed air, is kept in a strong glass container, placed head downward in a padded metal shell. The latter has narrow slits on opposite sides showing at all times how much liquid it contains. A threaded plug in a bell-shaped standard is removed when the extinguisher is to be refilled.

FILIPINO'S COFFIN IS HOLLOWED MAHOGANY LOG

WHEN a Filipino of some position dies, his body is placed in a casket hewn from a mahogany log and ornamented with bamboo. The native, whose funeral procession is the subject of the accompanying photograph, was of sufficient importance in one of the small islands of the Philippine group to be escorted to his grave by the chief magistrate of the village. The priest and two acolytes also go before the coffin, which is borne on the shoulders of five men. The mourners follow at the rear.

NOVELTY COMPUTES TAX ON RAILWAY TICKETS

An advertising novelty has been supplied to railway ticket agents which computes the eight per cent war tax now added to each fare. It consists of a revolving dial, with circles of figures on its face, mounted on a pad. After inserting a pencil in the hole at the edge of the dial next to the price of the ticket, and moving the pencil around to a point designated, the figure appearing in an opening at the left side of the pad indicates the amount of the war tax. A block of paper is provided for making other calculations.

ROLLING DESKS SAVE TIME FOR FIRM'S PAYMASTERS

Tables of special design, mounted on small wheels, are being used in a large manufacturing plant to enable paymasters to go through different departments and pay off the employes without taking them from their work or causing them to wait after hours for their wages. It has been found, too, that fewer accountants are needed on pay days. During a recent War Savings Stamp campaign several girls accompanied the tellers and induced many employes to invest in government stamps. Each table had a special police guard.

Manufacturing Concern's Force of Paymasters and Their Portable Desks Which are Taken through the Plant on Pay Days, Enabling the Employes to Procure Their Pay While at Their Work, without Waste of Time

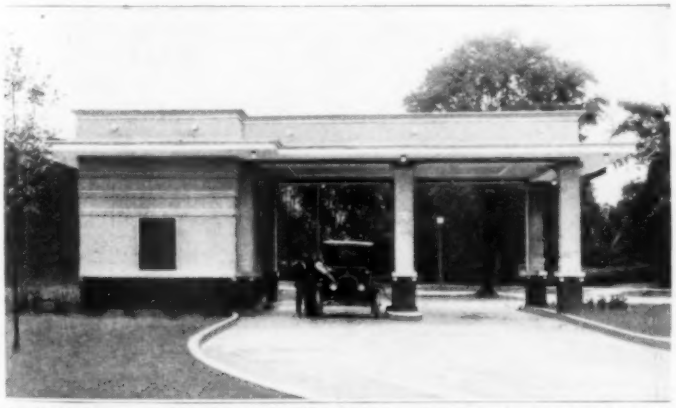
WESTERN RIVETER SETS WORLD SPEED RECORD

World's riveting records have been established and broken, and reëstablished with such frequency of late in the steel shipbuilding yards of the United States and Great Britain that it has been difficult to keep trace of them. A new record, however, and one so remarkable that it seems likely to have more than momentary life, has been set by Tom Horn and his crew in a yard on the Pacific Coast. This man drove 5,620 rivets in nine hours. Of these, 4,429 were 7/8-in. countersunk, and 1,191 were 7/8-in. snap. After completing the feat the workman asserted that he had learned so much during the day that he felt sure he could better his record in the future. The keen rivalry that has developed between riveters has had a pronounced effect in speeding ship production. This rivalry is not merely domestic but an international one, which keeps shipbuilders in America and England contesting for the honors, which are now held on this side.

Insert Shows Tom Horn with His Rivet "Gun" in Hand, While Below He is Pictured with His Crew, Using a Big Yoke Riveter

AUTO SERVICE STATIONS HAVE REST ROOMS

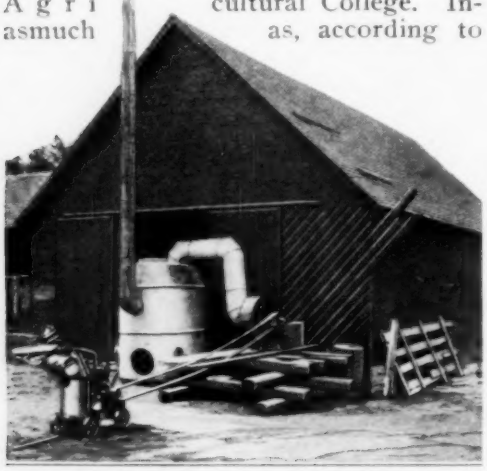
With a view to rendering a service which will attract patronage, a number of conveniences, including a rest room for women customers, have been included in each of numerous automobile service stations now being erected in various cities. The structures are of pleasing design and stand in the midst of grounds that are well cared for. The rest room measures 10 by 12 ft. and is attractively furnished. Toilet rooms are provided also, while a basement offers ample room for a heating plant and reserve supplies.



An Up-to-Date Automobile Service Station, Having Among Its Special Conveniences a Rest Room for Women Customers

DRYING OUTFIT CAN SAVE SOFT CORN AT LOW COST

That soft corn can be dried on the farm where grown at a cost of less than five cents a bushel for fuel and power, has been demonstrated by the Iowa State Agricultural College. Inasmuch as, according to



Over 800 Bushels of Corn was Dried in This Crib with the Outfit Shown, at a Cost of Two Cents a Bushel for Fuel and Power

estimates, over 100,000,000 bu. of corn in that state alone, out of last year's crop, was so soft as to lose its market value, the importance of this drying process is apparent. A furnace, a small engine, a fan, and a few feet of ordinary pipe only are needed to save the grain. In cribs which were experimented on, the moisture content of the corn was reduced from 30 to 10 per cent in 24 hours. The outfit costs approximately $400, the chief item being the furnace.

STUDY SOIL AERATION IN INDIA

Recent investigation in India has emphasized a number of interesting points relating to soil aeration in tropical farming. Tests have shown that flood irrigation on the fine alluvial soil of certain regions interferes with the ventilation between the particles of earth, forming a compact crust on the surface which keeps out the air. For this reason when irrigation was indulged in too freely the crop returns were less. Nitrification of the soil had been hindered. Good results have been obtained by a preliminary watering before planting, making it possible to get along with about half the amount of water formerly used. The adding of sand to certain soils greatly increased nitrification and plant growth, it was found.

NAVY MEN TO SUPERVISE CAMOUFLAGE OF SHIPS

Camouflage painting for American vessels is to be standardized. Work of this character done on all merchant vessels for the Shipping Board will hereafter be under the supervision of the Navy Department. Types and designs of camouflage painting for general use are to be furnished to a local representative known as the "district camoufleur," who will determine the particular design most desirable for individual ships in his region. For vessels demanding special consideration, the Navy Department will undertake to supply the necessary instructions, so far as practicable. The new arrangement, it is believed, will result in uniformly effective camouflage painting.

IMPROVED MOVIE REEL HAS RECORDING FEATURE

An improved reel for motion-picture films is provided with a label attached to one side of the reel on which the name of the film, and other important data, can be written for the convenience of the operator and others. When a new film is substituted for the old one, the writing can be quickly erased by rubbing the label with a wet finger or cloth. If preferred, a label is provided on which more permanent entries can be made in ink.

UNSUNG HEROES

PART IV—THE ARTILLERY FLIER

By E. T. Bronsdon

THE sunlight glints from the gleaming white planes of the two German Walvet scouts. They come over the allied lines, circling cautiously, yet with a hint of challenge in their manner. They know there is no danger from anti-aircraft fire in this particular sector, so they dawdle in the lower air levels. They are looking for trouble—of a certain kind.

The Walvets are used by the Huns in pairs always, and invariably against single planes of the allies. The pilots have been trained in teamwork against a single enemy since they first took the air, and have attained a sinister proficiency. All they need is to have the odds two to one in their favor, and their coöperative skill is backed up by confidence. If two British or French planes rise to engage them, however, they decline combat, preferring to leave the more equal engagements to the steel-plated Gothas.

"This machine disdains the old-fashioned spiral ascent; it mounts in a straight line and at an angle of 80° from the ground! If necessity required, it could mount perpendicularly."

The allied fliers have come to know this trait in the Walvets, and though the white machines never carry observers nor are used for reconnaissance work, there are very few occasions upon which some skilled

air veteran or aspiring novice will not take the air to engage them.

On the flying field a powerful motor roars. A long, lean machine, with wings that look to be closely cropped, taxis across the grass for a short distance and rises abruptly. It is the new Blauvrois, the latest wonder machine of the French escadrilles. Even the mechanics still are moved to exclamations of praise as it rises. This machine disdains the old-fashioned spiral ascent; it mounts in a straight line and at an angle of 80° from the ground! If necessity required, it could mount perpendicularly, but this makes a useless risk in ordinary circumstances, for a pocket of air might throw it into the deadly tail spin.

The Blauvrois pilot on this occasion is no novice. He is the ace of the airdrome, a seasoned six months' veteran who already is credited officially with 14 Hun planes. The Walvets circle to intercept him. He cuts under them and gains their level without mishap. Ten seconds tell the rest of the story. The fire of his forward bracket of machine guns—on these planes the "coffee mills" are mounted in pairs to single lanyards—cuts through the flying wires on one of the Walvets. It slips sidewise like a dry leaf fluttering in the autumn wind.

Marvel machines, air maneuvers carried on at 150-mile-an-hour speed, individual skill, daring and bravery, and a certain modicum of chivalry—this is the romance of air fighting that grips the imagination. Every war story has its air ace or aces, every reader knows the names and achievements of his heroes, and can tell tales of their accomplishments that make the jousts of Arthur's knights pale in comparison.

There is no wish in any quarter to detract from the glory of the aces. May some greater Mallory or Tennyson chronicle their exploits in full word color! The regrettable part connected with giving the aces their full due is that their spectacular splendor obscures our judgment in respect to other branches of the service—branches in which death is even less easily balked, though there is nothing whatever of grand-stand nature in the work.

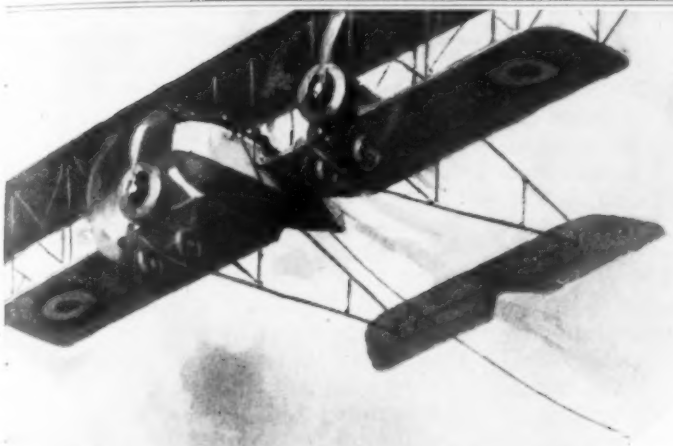
Who, for instance, knows the name of one artillery flier? Who, in the lay public, has read even a terse description of his work? It is probable that few can answer in the affirmative, for this airman is a member of no "flying circus." He never seeks out duels among the tufts of cirrus cloud; indeed, he engages in actual combat rarely, and then always against his will. Most of his flights are limited to 20 minutes' length, and are made at a height of from 200 to 3,000 feet from the ground. He has definite business to perform in this limited space of time, and he is compelled to ignore enemy fliers, no matter what they may do to him. True, he does carry one machine gun, but this is for use only when Fritz's aircraft seem about to prevent him from carrying out his purpose.

Somewhere back in the mysterious official circle known everywhere as "H. Q." the order that concerns him originates. It mentions dawn on a certain day and commands tersely that "targets 14 to 22 inclusive be put out of action" for a minimum period of six hours.

In battalion headquarters much office activity follows. The huge topographical map, covering one entire wall of the room, is consulted. Card indexes yield one card for each numbered target to be "strafed." Hastily the latest changes shown on the topographical map are indicated on the cards, and duplicates sent to each battery commander.

It is the 150-millimeters this time. There are two varieties in this caliber, the mortars and the long rifles. Both are used mainly for purposes of demolition, the mortars taking care of short ranges and the rifles all targets at distances over two and one-half miles. Though the 75's still are the important guns for barrage work, these 150's are the pride of the French when it comes to smashing up Fritz's positions.

Attached to one of the mortar batteries was the artillery flier Lieutenant C. With his observer, his map, and his

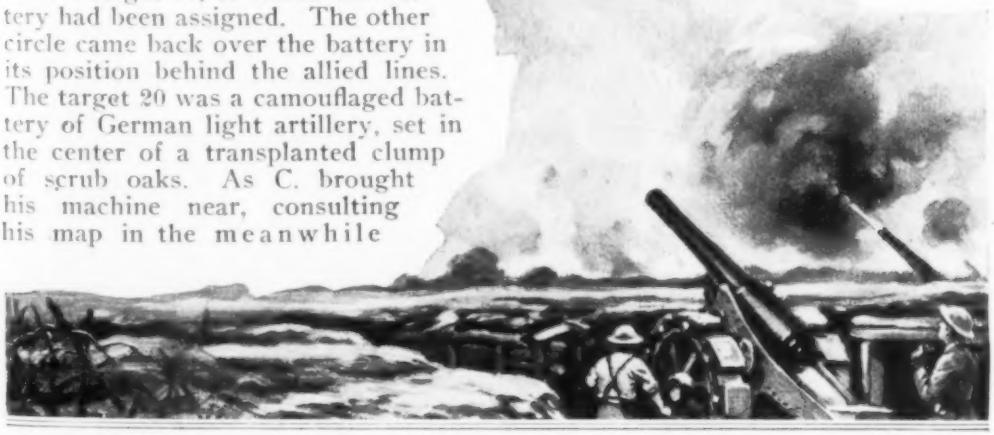


"Dropping to a height of 300 feet it swept over the firing battery. C.'s observer scribbled the correction messages on a slip of paper, inserted them in a signal arrow, and dropped it."

orders he took flight in a heavy Caudron plane. This is a machine one vintage older than the Nieuport, the bus that now is giving way to the new Blauvrois. The Caudron is slow and incapable of giving successful battle to the latest German air craft, but it still earns its salt with the artillery.

The business of Lieutenant C. was to pilot his old craft in a figure "8." One circle of this numeral embraced target 20, to which his battery had been assigned. The other circle came back over the battery in its position behind the allied lines. The target 20 was a camouflaged battery of German light artillery, set in the center of a transplanted clump of scrub oaks. As C. brought his machine near, consulting his map in the meanwhile for the exact position, his observer unwound the wire aerials. These streamed backward, supported only by the forward motion of the airplane. The antenna of the radio outfit was set in the upper plane of the Caudron.

The whole program had been set forth in C.'s orders. The five 150's would fire in turn, each dropping three projectiles on the target during each turn. C.'s observer must send constant wireless messages to correct the fire of each gun. Ideally—that is, if there had been no Germans in the vicinity—it would have taken only from one to three corrections for each gun,



and these could have been made in the course of a very few minutes, destroying the battery target.

As it actually happened, however, the moment gun No. 1 dropped its three shells in the region of the battery the German defense mechanism started. The three shells fell 50 yd. north of the outer rim of the little grove. Instantly C.'s observer signaled back, "Nine o'clock. Fifty yards." The meaning of this message is simply that the firing battery regards the region of the target as a gigantic clock, with the center of the face the target itself. In this particular instance twelve o'clock was due east, six o'clock west, nine o'clock north, and three o'clock south, with the other hours in corresponding positions. The moment the radio operator at the firing battery received the wireless message he had the gun pointers correct the range on gun No. 1 fifty yards to the south.

The Germans knew well the weakness of this system, however. An air craft possesses only very weak wireless, and the powerful land machines are able to drown out all messages sent, once they tune up to the same wave length. C.'s observer was able to get only the first message through on the 200-meter wave-length tuning of his apparatus when a multitude of crashing sparks in his aerials told him that the Germans had caught him. Instantly he tried 300 meters, but because of the many defense wireless apparatus that were engaged in smashing up the messages of the nine signal machines engaged, this was even worse. He tried still another length, with the same result. Meanwhile guns No. 2 and No. 3 had missed the target badly, No. 2 dropping shells 350 yd. to one o'clock, while No. 3 selected a stagnant pond 200 yd. to six.

There remained only one thing to do. Swinging about, the Caudron put back in the western curve of the figure 8. Dropping to a height of 300 ft. it swept over the firing battery. C.'s observer scribbled the correction messages on a slip of paper, inserted them in a signal arrow, and dropped it.

The signal arrow is a metallic tube, hollowed for such a message, and weighted so that it always falls with the point of the arrow downward. Red and white streamers of cloth are attached to the upper end, so that it is readily visible. The procedure of signaling in this fashion is far less satisfactory than wireless, as the guns have to wait until the plane gets back to the scene of bombardment before firing again.

Also, the delay caused gives the Germans a chance to send up defensive planes, or to get "Archie" unlimbered for action. On this occasion it was Archie. The moment C. and his observer got back over the target they were met in the air by a comprehensive bracket of shrapnel and high explosive bursts. The "H. E.'s" luckily missed at first, but C. was so near the ground because of having to drop the message that the spreading shrapnel riddled the wings.

Without mishap other than a weakening of the stanch Caudron due to the snapping of two wires, the remaining guns were given their first correction. Just as the two started back with a second correction for gun No. 1, which had deviated 30 yd. too far toward three o'clock, the Caudron was bumped from below by the unmistakable explosion of an "H. E." The pilot caught the reeling plane before it crashed to the ground, but he found difficulty in bringing its nose around toward home. Investigation showed that the rudder had been detached neatly by the explosion! Steering with his ailerons and box planes he swung her about, just in time to receive a dose of shrapnel from Archie.

The Germans, seeing that the machine was in distress, trained several of the anti-aircraft guns on C.'s plane. As he wabbled away a bullet cut through the flesh on his thigh, others riddled the gasoline tank, while one vicious burst tore away part of one propeller blade. The engine stopped, and without sufficient height or headway to coast back to his battery, C. brought his plane to earth on top of an

allied barbed-wire gate which protected one of the passages leading from the support to the reserve trench.

One by one, as planes are put out of action, other Caudrons take their place, controlling the fire until the batteries of the Huns that have been marked out are unmistakably silenced. The plane that went out to complete the work started by C. found it already finished. The 150 battery was methodically pumping shells into an ever-widening crater that once had been a grove of scrub oak.

SEATTLE WOMEN TO BOYCOTT GERMAN GOODS

A great army of the loyal women of Seattle have originated a league for the protection of our soldiers and sailors who may fall into the hands of the Germans. These women have wisely made use of an argument which appeals to the cupidity of the Hun, and when he hears of the thousands of American women who are signing this pledge and who will live up to it, he will do well to accord to our boys the treatment which civilized nations give to prisoners of war. Every woman in the country should take this pledge, and the quicker the signatures are received, the sooner the movement will accomplish its purpose. The pledge, with space for signature, is printed on page 142 in the advertising section.

NEW FRUIT-SPRAYING GUN REQUIRES NO EXTENSION

An advantage possessed by a new spray gun, which can utilize the capacity of any power spray pump, is that

Spray Gun Which can be Quickly Adjusted to Produce Either a Broad Spray or a Stream That will Reach the Tree Tops

one man can do the spraying alone, eliminating the use of bamboo extensions, nozzles, and other fittings. The gun can be held in one hand and the pump operated with the other, if desired. A third of a turn of the handle changes the discharge from a straight stream reaching the tree tops, to a wide-spreading one. A further turn shuts off the nozzle entirely.

NEW TYPE OF STAVES USED IN CONCRETE CORNCRIBS

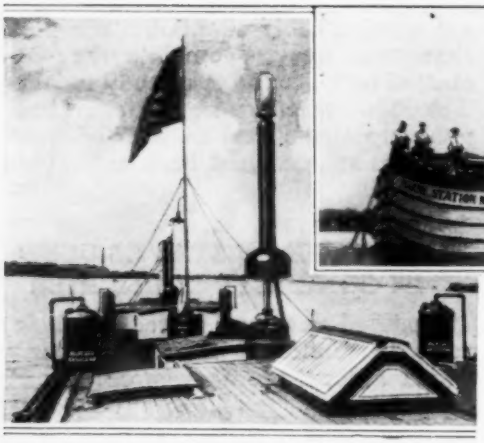
Modified concrete staves are being used in building circular corncribs which are rat-proof, fireproof, moist-

A 2,000-Bushel Corncrib Made of Concrete Staves, Each Provided with Two Barred Openings Which Permit Ventilation but Keep Out Rodents

ure-proof, and well ventilated, one of which is illustrated herewith. The staves are placed on end in tiers and measure 30 by 10 by 2½ in., and are each provided with two rectangular barred openings which permit ventilation but keep out rodents. Tile with screened openings at the outer ends connect with drainage ways in the floor and a central chimney aids in the circulation of air through the grain. The crib shown will hold 2,000 bushels

GOOD FEATURES COMBINED IN RADIO PRACTICE SET

An improved practice instrument for wireless students in which a number of excellent features have been combined has recently been placed on the market. It consists of a regular telegraph key without a circuit breaker, a



Below Deck Are Eight Tanks Having a Total Capacity of 18,000 Gallons. Right: Upper Deck from the Stern, Showing the Arrangement of the Pumps

special high-pitch buzzer, a miniature incandescent lamp with a socket, a switch, five binding posts, etc. An induction coil enables the operator to use standard radio head sets, which are generally of high resistance, with maximum efficiency. With this outfit the student can be given both sight and sound instruction.

A Radio Practice Set Designed for Giving Both Sight and Sound Instruction: The Induction Coil Permits the Student to Use Standard Radio Head Sets

WIRELESS SIGNAL LAMP FOR USE AT FRONT

A wireless signal lamp has been devised for various kinds of war work which enables the users to keep up communication under conditions where it would be difficult or impossible to stretch telephone or telegraph wires. A barrage fire, for example, would be no hindrance to signaling by this new apparatus. It can be used between a ground station at the battle front and an aeroplane a considerable distance away, flying over enemy territory.

Side View of a 100-Foot Barge, Converted into a Service Station for Motorboats: It Replenishes Its Supplies from a Tug

FLOATING SERVICE DEPOT FOR MOTORBOATS

Stationed in one of America's busiest inland waterways is a 100-ft. barge converted into a marine gasoline-service station which makes it unnecessary for motorboat owners to go ashore for fuel, etc. The craft is equipped below deck with four 3,500-gal. gasoline tanks, three 1,000-gal. motor-oil tanks, and one 1,000-gal. kerosene tank, while the pumps are on the upper deck. A long hose connection is provided which is lowered to boats coming alongside for service. The barge replenishes its supplies from a tug and never leaves its anchorage except at the close of navigation.

AIRMAN FLIES UNDER FOUR NEW YORK BRIDGES

In celebration of the French national holiday, July 14, a French airman flew beneath all four of the bridges over East River in New York, in a single flight—a feat never performed before. The Frenchman, who is an instructor at an aviation field in the East, drove a big American-built machine equipped with a Liberty motor. He first reconnoitered along the waterway to make sure that no boats were in position to interfere with his performance. Then with a long swoop he shot under Brooklyn Bridge and continued on under the Manhattan and Williamsburg spans. After making a sharp turn to follow the course of the stream, the flier dipped again and shot under Queensborough Bridge.

STEAM DRILL IS MOUNTED LIKE A PILE DRIVER

A resourceful quarryman has rigged up a steam drill somewhat resembling a pile driver, which has proved a great time-saver. The drill is bolted to a frame to give it added weight and is provided with channels so that it can slide up and down in vertical leads like a drop hammer. The whole outfit is mounted on rollers and can be moved quickly from one hole to the next. The fact that long bits are used saves time otherwise lost in changing bits. The improved mounting about doubles the capacity of the drill.

CONDUCT ENGLISH CLASSES FOR FOREIGN EMPLOYES

Classes in the English language are being conducted for the benefit of foreigners employed in one of the large mid-western industrial plants. For this purpose instructors have been employed and provisions made for holding classes regularly after the close of the business day. During warm, pleasant weather, the roof of one of the company's large buildings is used, so that men who have been confined indoors during work hours may have fresh air along with their studies.

Foreign-Tongued Employes of Large Manufacturing Plant, Attending an Open-Air Class in English

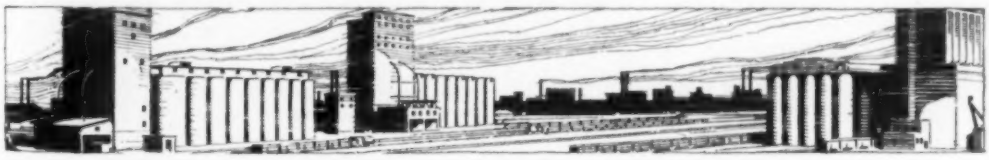
THE GRAIN ELEVATOR

By BERTON BRALEY

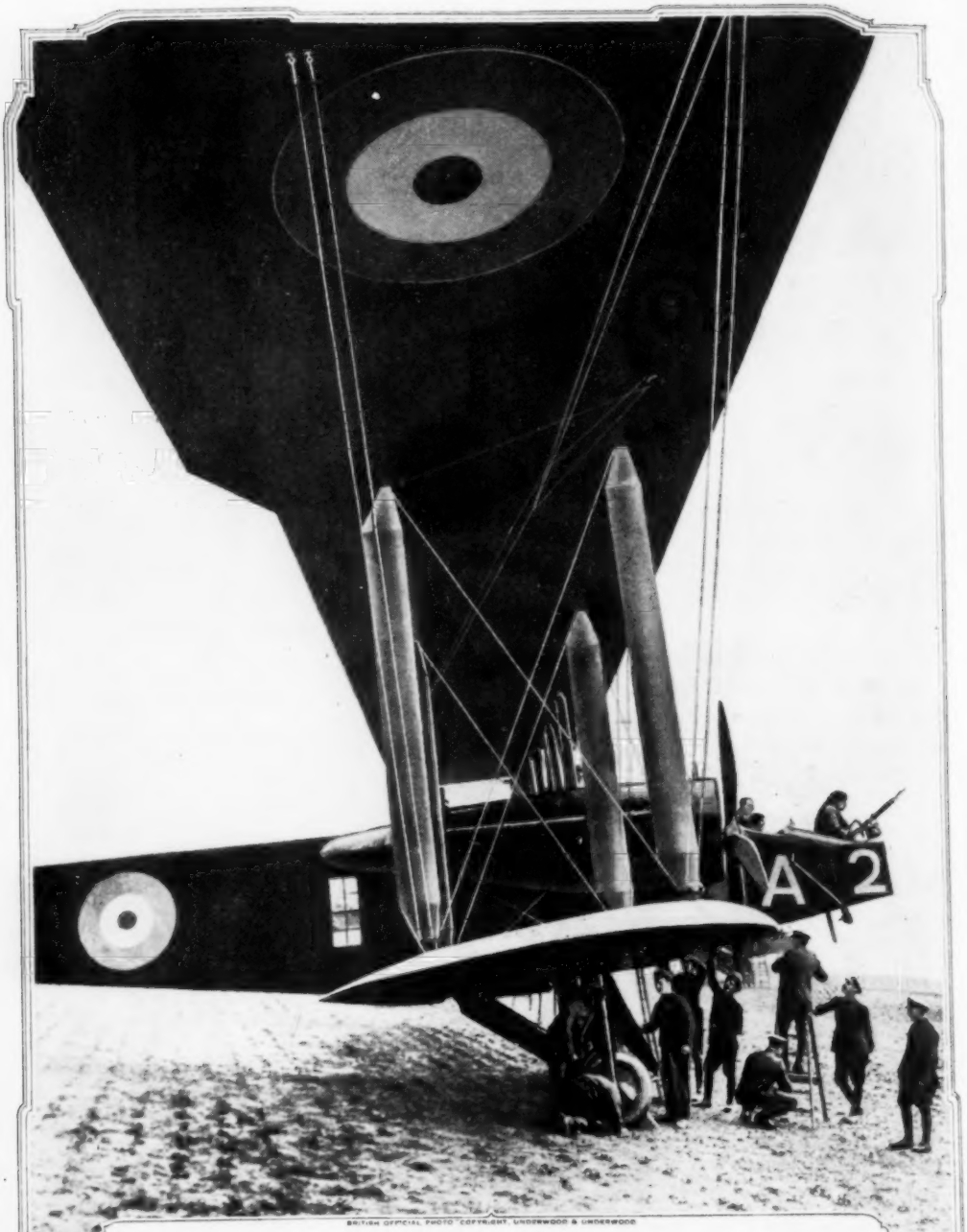
IT is not beautiful, it bulks forth huge
A storehouse wrought of concrete and of steel
Resorting to no cunning subterfuge
To hide its simple purpose, or conceal
Its plain utility. And yet it shows—
To eyes that see beyond the outward shell—
Beauty of Service; and its walls enclose
Bounty that feeds the world wherein we dwell.

THIS edifice supplies a vital part
Of that immense industrial machine
By which we serve the cause we have at heart—
This war for everything that's fine and clean.
It stores the harvest of the generous soil
Against the need of men, and in good time
Pours forth the food for those who work or toil
In true devotion to a task sublime.

AND thus this structure, ugly to the gaze
Has beauty of the stalwart, rugged kind
Which wraps the laborer who goes his ways
Doing his duty on the work designed.
It stands forth grim and mighty as a rock
Fit for the service it was fashioned for,
Its ramparts proof against the battle shock,
A fortress on the food line of the war!



GIANT HANDLEY PAGE BOMBING PLANE



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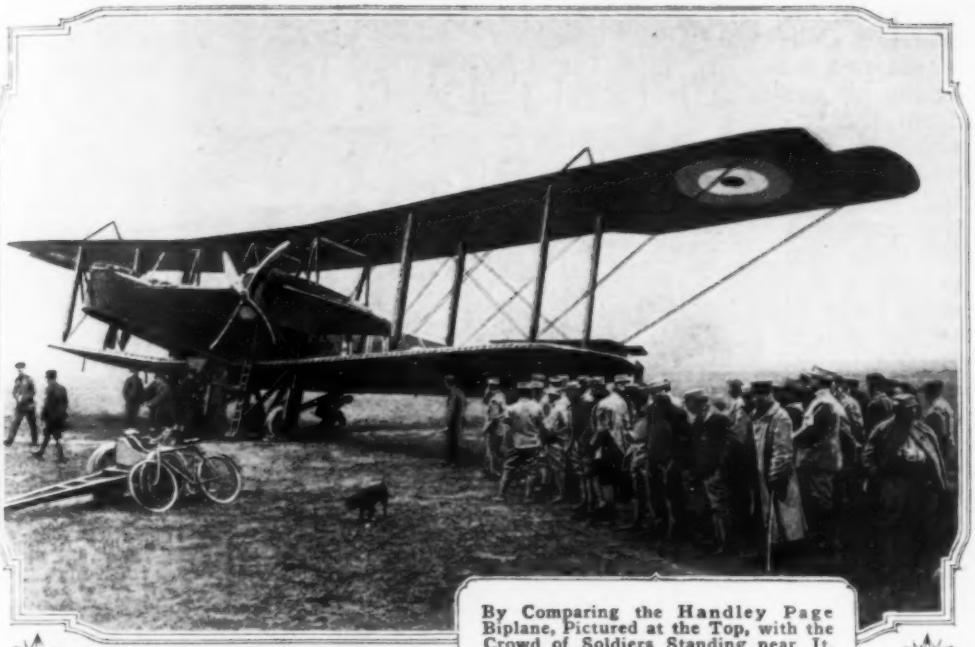
TUNING a big Handley Page bombing plane preparatory to a raid against enemy positions in the western theater: This type of British craft is one of the largest in existence and is said to hold all world's records for heavy machines carrying from one to 21 persons. Revived interest in the proposed transatlantic flight, which aeronautical authorities hope may yet be attempted this year, has resulted in a discussion of plans for the construction of special Handley Page machines for the great event. British aerial officers are confident of the ability of the Rolls-Royce engine to make good this year, and the Liberty motor next year, in such a flight.

ONE OF LARGEST AIR CRAFT IN WAR



By Comparing the Handley Page Biplane, Pictured at the Top, with the Crowd of Soldiers Standing near It, an Excellent Impression of the Size of the Great Machine is to be Gained. The Peculiar Character of the Ailerons is Here Shown Clearly

Above, the Handley Page Plane is Apparently being Loaded with Bombs, Some of Which are to be Seen in a Row beneath One of the Wings. The Craft Has a Spread of 98 Feet, is Equipped with Two 12-Cylinder Motors of 560 Combined Horsepower, and is Pulled by Tractor Propellers of Four Blades. Among Its Distinguishing Features Are Its Motor Nacelles, Its Protruding Ailerons, and Its Biplane Tail

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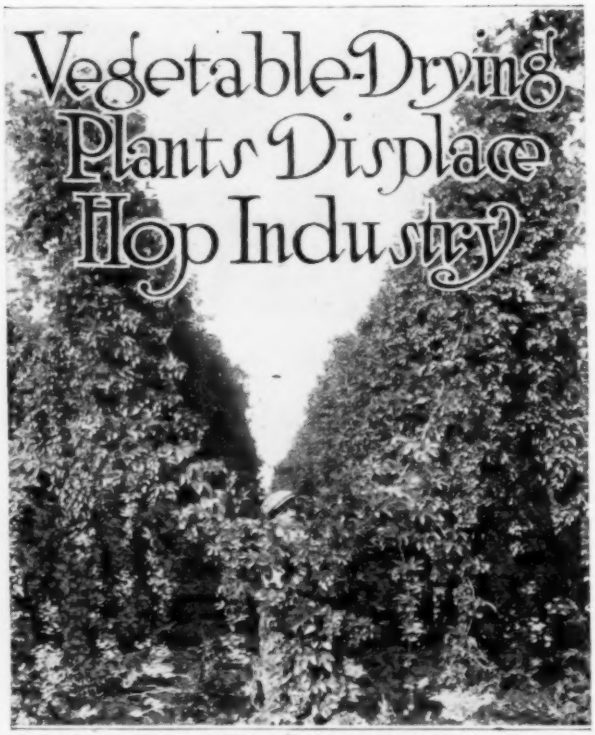
Vegetable-Drying Plants Displace Hop Industry



A California Hopyard Where Vegetables may Soon be Growing: The Largest Hop Grower in the World, Seeing the Spread of Prohibition, has Decided That His Industry is Doomed and is Turning His Hopyards into Truck Gardens

By ROBERT E. JONES

THE largest hop grower in the world, a California man, taking his cue from the onrush of prohibition, is turning his hopyards and kilns to the raising and drying of vegetables. Hundreds of tons of dehydrated garden truck will be produced this year by the former hop king. Dried vegetables are not common on the American table and the industry is still an infant one. Introduced by virtue of war conditions, however, they doubtless will find permanent favor with the American housewife.

A Tall Hindu and a Little Japanese Tilling Vegetables to be Dried—Two of Many Nationalities Employed in This Industry

Most of the hops grown in the world are used in the manufacture of beer. Though they bring good prices now, the advance of prohibition promises to make them an unprofitable crop. An expensive plant is needed to produce them—the richest kind of sediment land and elaborate drying kilns. These kilns are highly specialized factories, heated by steam, and suitable, probably, for no other purpose than the evaporation of moisture from soil products.

Until recently the hop grower mentioned had 2,500 acres of sediment soil in California, Oregon, and British Columbia growing hops. He was the largest grower in the world, and his equipment included several drying kilns on each of his five hop farms. Seeing the approach of the prohibition wave from afar, this grower set about altering his business to meet the impending flood. Dried vegetables as a successor to hops were suggested by the process of elimination. There was nothing else the public might care to buy that hop kilns could be used for. But with a few alterations they were ideally fitted for drying vegetables. As for the soil of the hopyards, no truck gardener could hope for a better paradise.

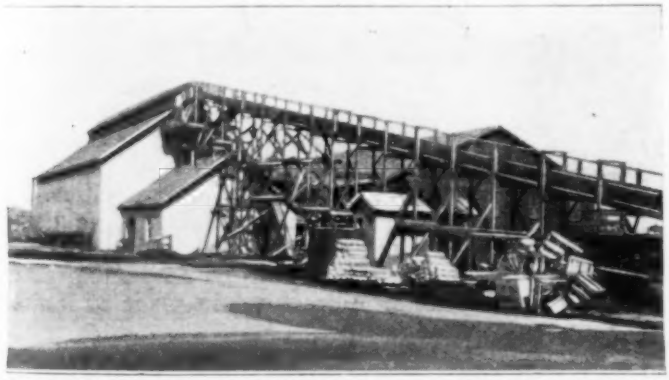
Experiments were started early in 1917, when about 100 acres of vegetables were grown and dried in Sacramento and Tehama counties. The

first season's output amounted to about 100 tons, and this was sold mostly to steamship companies. This year the same man planted 670 acres of vegetables for drying in California alone. Also contracting agents were in the field arranging for outsiders to grow vegetables for evaporation in the former hop plant. Contracts for the growing of tomatoes between the tree rows of young orchards in the Sacramento and San Joaquin valleys were made for this year at $14 a ton. Formerly $8 was a good figure. Since the yield of tomatoes in the state runs from 8 to 20 tons to the acre, these orchardists will be able to pay their development expenses this year and make a profit besides. The kilns can dry 10 times the amount of vegetables that the hop lands can grow. Best of all, it will be possible to use the expensive kilns the year round, instead of only a few weeks in the season, as was the case when hops were grown exclusively. Spinach, cabbage, celery, potatoes, and root crops are harvested late in the fall, in winter, and in early spring, and dried immediately. Tender vegetables such as tomatoes, pumpkins, squash, etc., will keep the plant busy in summer and early fall. One unit alone of the one plant near Sacramento has a capacity of 50 tons, green, daily.

Filling Coffee Barrels with Dried Potatoes for Shipment East: There Is a Particularly Good Market for This and Other Similarly Prepared Vegetables among Steamship Companies

Before drying, most vegetables are peeled and shredded by machines such as those used in large hotels and in the United States Army training camps. Vegetables that cannot be handled by these machines women prepare by hand. Men attend the peeling and shredding machines, and dump the shredded food onto screen trays which are slipped into racks in the drying kilns. No preservative is used in drying; it has been found entirely practical to eliminate sulphuring.

After two to eight hours, varying according to the kind of vegetable and the outdoor temperature at the time, the trays are taken from the racks and trucked into the packing room. The process is completed save for packing in cartons. Trays are emptied from a balcony around the kiln into a bin on the floor below, where the vegetables are put into boxes and placed before the women



On the Left Is a Hop Kiln Now Used for Drying Vegetables, Which Are First Prepared in the New Cutting Shed on the Right. The Inclined Trestle was Formerly Used for Elevating the Hops

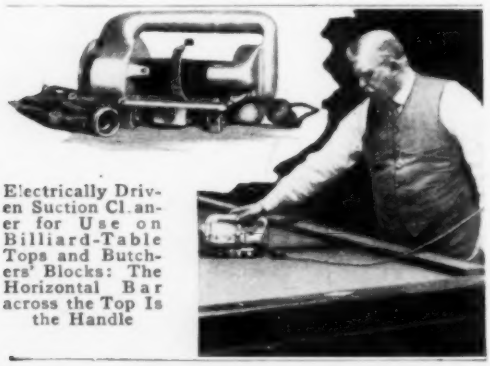
Left: A Young Woman in the Cutting Room with a Tray and a Barrel of Dried Turnips. The Filled Barrel is So Light She Can Lift It Easily. Right: A Wall in a Transformed Hop Kiln, Showing One of a Bank of Drying Trays Drawn Out for Inspection

carton packers. The finished product resembles tiny wood chips, save for variations in color, and is brittle. Tasting the dried vegetable discloses a high concentration of sugar and of the characteristic flavor.

The chief argument for dried vegetables is the fact that they contain a large amount of food value in proportion to their weight and bulk. A hundred pounds green reduces to as low as five pounds dried, the average reduction being about ten to one. Thus it may be realized that dried vegetables are many times lighter and less bulky than canned goods.

SUCTION DEVICE CLEANS BILLIARD-TABLE TOPS

A new electrically driven brush, operating on the same principle as a vacuum cleaner, is designed especially for cleaning the tops of billiard tables, butchers' blocks, etc. It is about the size of a tailor's goose, with a horizontal handle extending across the top. At one end is a rotary brush which loosens the dirt and dust, while at the other end is a suction fan that draws off the waste into a bag.



Electrically Driven Suction Cleaner for Use on Billiard-Table Tops and Butchers' Blocks: The Horizontal Bar across the Top Is the Handle

SAND AND WATER MIXTURE FOR COAL SEPARATION

What is believed to be a commercially feasible substitute for the laboratory method of separating different materials by introducing fluids of greater specific gravity than the lighter particles, and less than that of the heavier ones, was recently explained to the American Institute of Mining Engineers. It consists of using a mechanical mixture of water and very fine sand. Such a mixture, created and maintained by agitation, is said to be of suitable specific gravity for the separation of coal and its impurities. A fluid mass capable of floating feldspar, quartz, limestone, and other rocks is similarly produced by employing magnetic iron-ore sand in place of quartz sand.

¶It is estimated that for a 60-grain grinding wheel, having a 1-in. wide face, the number of cutting points per minute is about 80,000,000, at a peripheral speed of 6,000 ft. per minute.

AMERICA'S YOUTH STRIKES ITS FIRST BLOW

At Cantigny the Hun Learned That Bayonets Backed by Yankees Are Dangerous, the Kaiser's Assurances of Their Harmlessness Notwithstanding. The Picture, Valuable as a War Record, Shows the First Wave of American Boys Going "Over the Top"

Cantigny Gave Our Boys Their First Chance to Show Form, and the Opportunity Was a Joyous One. Above, Accompanied by Tanks, Our Young Giants are Advancing to the Attack That Resulted in Their First Real Victory

If the Mother or Sweetheart of the Young Fellow at Left Wishes the Camera Man had been Working from the Other Side, She Wishes What 110,000,000 Other Folks Also Wish. Anyway, He is Bagging Huns at Cantigny and We're All "Right Proud" of Him

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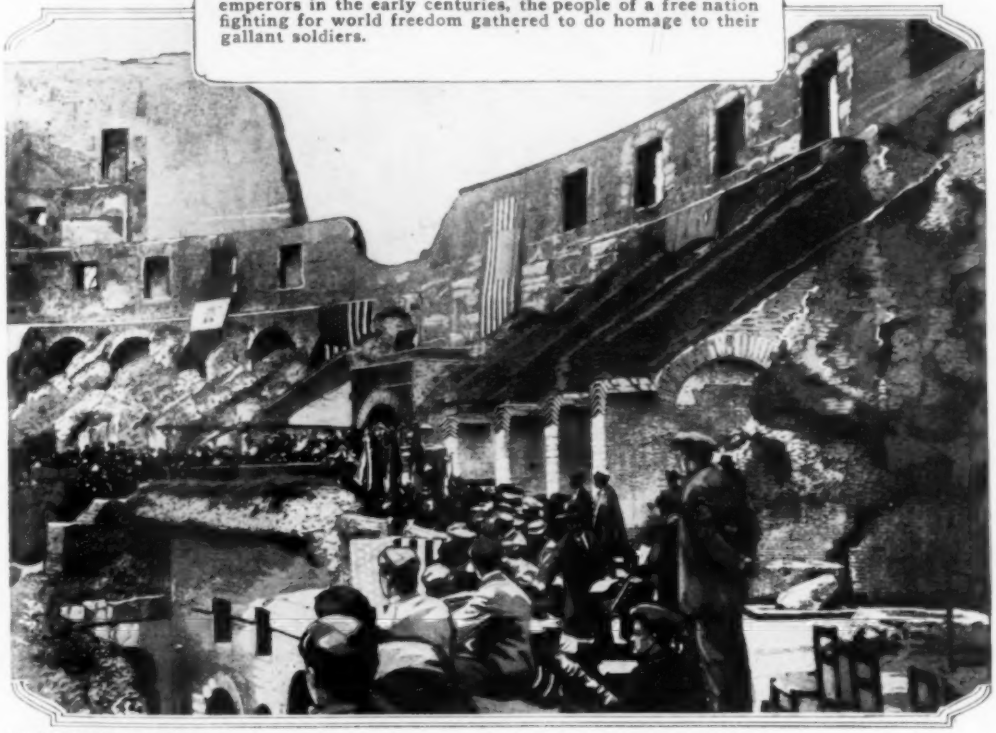
PHOTOGRAPH SHOWS TRANSPORT BEFORE SINKING AT SEA

Wearing Life Preservers and Awaiting Orders to Take to the Ship's Boats, American Soldiers aboard the "President Lincoln," Sixth in Size among Our Transports, Which was Torpedoed and Sunk Somewhere in the Naval War Zone the Last Day of May: The Vessel Was One of Four German Liners That Retained Its Original Name after being Taken Over by the Government. It Was on Its Homeward Voyage

ANCIENT COLOSSEUM SCENE OF WAR CELEBRATION

THE third anniversary of Italy's entrance into the war was celebrated May 23 by a great public patriotic demonstration in the age-worn Colosseum at Rome. The flags of the allied nations adorned the scarred, weathered walls of the great structure within which thousands of Italians, and the diplomatic and military representatives of other countries, gathered. In this crumbling world-famed monument of despotism and autocracy, where gladiators and wild beasts slaughtered each other for the entertainment of emperors in the early centuries, the people of a free nation fighting for world freedom gathered to do homage to their gallant soldiers.



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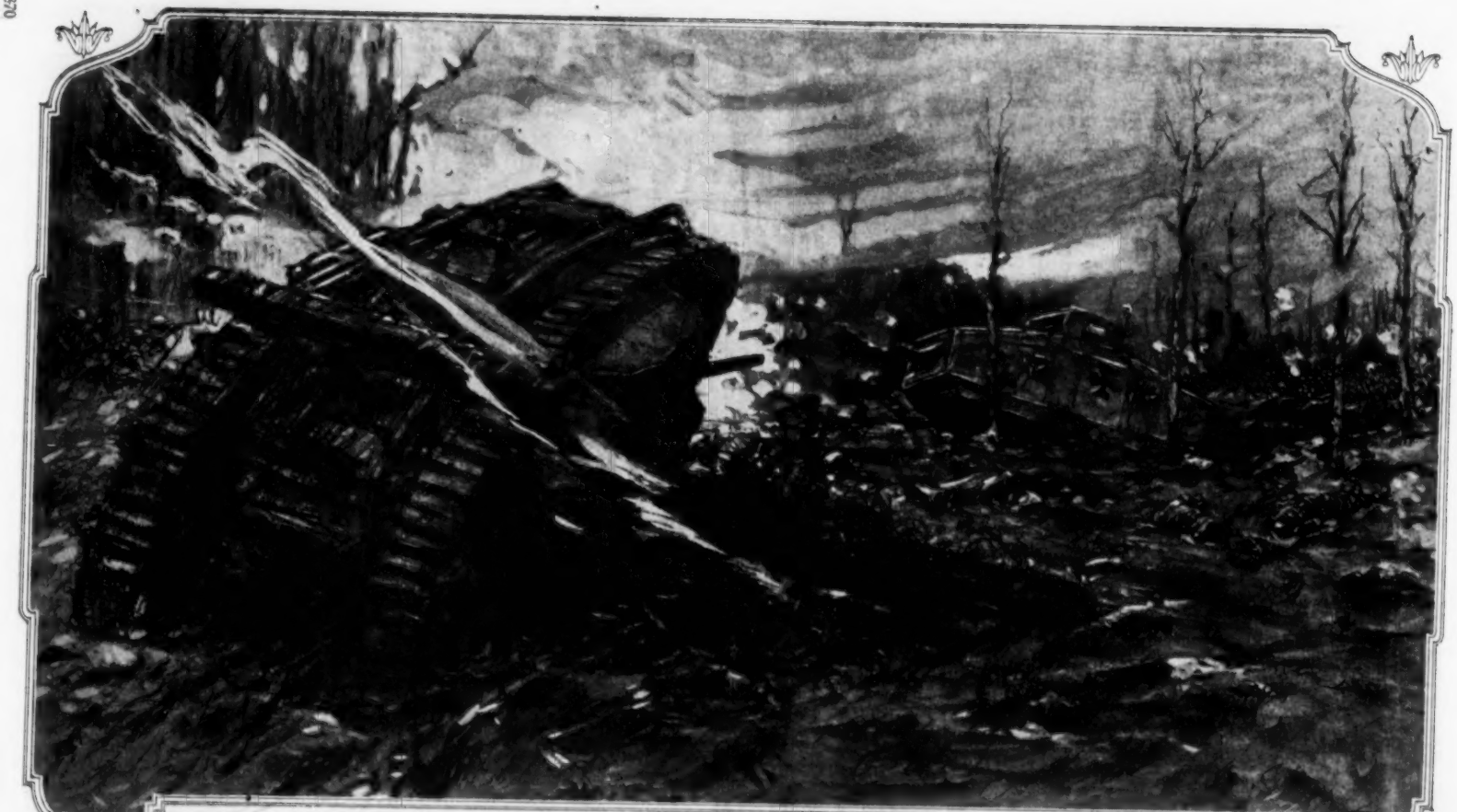

BRITISH AND GERMAN TANKS LOCK HORNS FOR FIRST TIME

HERE is a picture that records war history of especial significance—the first pitched battle between British and German tanks. The engagement took place last April on the western front when the Hun "dread-a-lots" made their début and suffered defeat. As six German tanks appeared, some big British veterans rolled forward, spitting fire and steel. The fight was heated and brief. The enemy was put out of action.

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RARE PICTORIAL CURIOS FROM ARMAGEDDON

French Observation Balloon Decorated with Four Wound Chevrons in Honor of Its Several "Hospital" Experiences

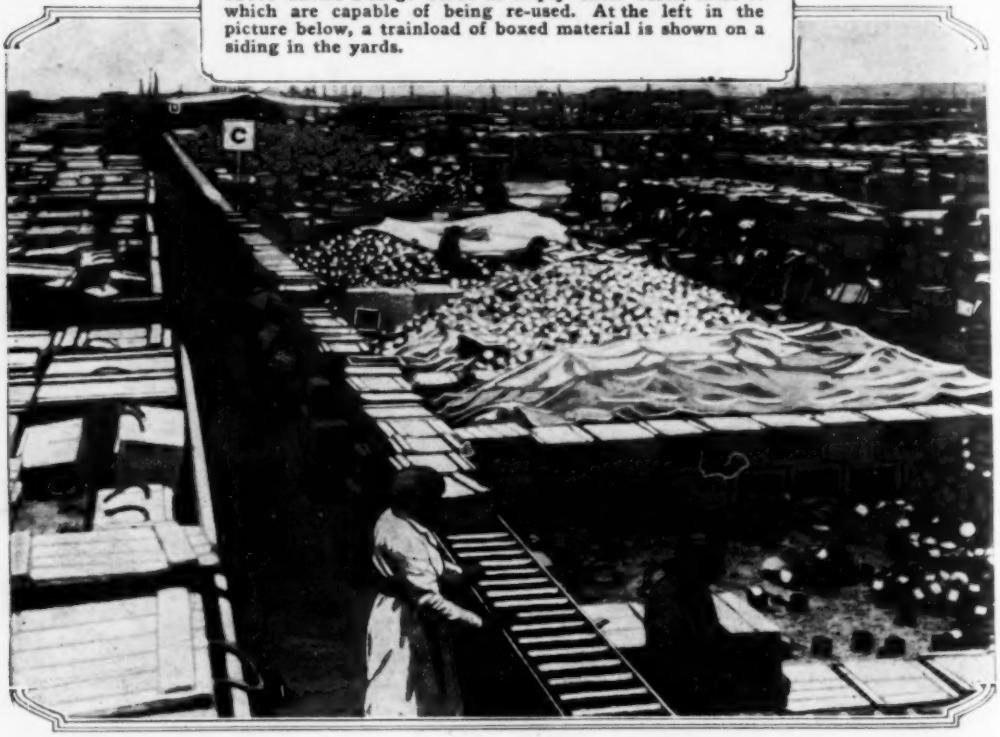
Lieutenant Eddie Rickenbacher Standing beside the Wing That Broke from His Plane and Fell to Earth While He was Fighting Three Hun Machines Aloft

These Two Little Ragdoll Fetishes, Rintintin, the Popular Chimney-sweep with His Bell, and His Sweetheart Nénette, are Commonly Worn in Paris as a Charm during Air Raids and Bombardments, and have also been Adopted by Fighting Men

Two British Airmen Inspecting Their Trophy of a Battle in the Clouds: The Crippled Plane of the Defeated Enemy, It will be Observed, Bears on Its Fuselage Information Such as One Frequently Sees on the Sides of Freight Cars on American Railways

SOME CASUAL VIEWS IN WAR'S JUNK YARD

PRESENTED herewith are two photographs that portray one of the important and interesting economic phases of the war. They show an enormous clearing ground for the débris of the world's greatest battle fields. Everything that has any salvage value whatever is shipped to this point, sorted, classified, and dispatched to repair stations and reduction plants. In this way enormous waste is obviated and materials are conserved. The photograph above shows a large stock of empty shell cases, most of which are capable of being re-used. At the left in the picture below, a trainload of boxed material is shown on a siding in the yards.



CAMERA GLIMPSES OF INTERESTING WAR STORIES

At the Left the World-Famed Equestrian Statue of Jeanne D'Arc is being Removed from Its Pedestal before the Cathedral at Rheims, to be Transported to a Place of Safety. It Is in Perfect Condition, Except for the Sword, Which was Broken by a Shell Fragment

BY COURTESY OF L'ILLUSTRATION

Because of the Presence of Many Chinese Coolies, Such Signs in France as the One at the Right are Printed in English and Chinese

German Hand-Grenades Stacked on the Fire Step of an Abandoned Trench: To All Appearances the Enemy Evacuated the Position for Reasons Other than Lack of Ammunition

The Hun has been Formally Introduced to the United States Marine and has Found Him to Be Much as We at Home have Known Him. This Picture Shows Some of These Heroes of a Certain French Sector Donning Their Masks, in Response to a Gas Alarm, and Hurrying to Shelter

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BORDER CITY IS TO HAVE STATUE OF LIBERTY

No good reason has ever been advanced for New York's monopoly of the Statue of Liberty. Therefore a 17-ft. reproduction of it is being made for erection in an El Paso park, where it will be visible to those crossing the border from Mexico and serve much the same function as the original on Bedloes Island. It is made of a fiber and plaster compositon that will undoubtedly withstand exposure for several years in the mild, dry Texas climate.

Putting the Finishing Touches to the 17-Foot Copy of the Bartholdi Statue of "Liberty Enlightening the World," Which is to be Erected on the Mexican Border

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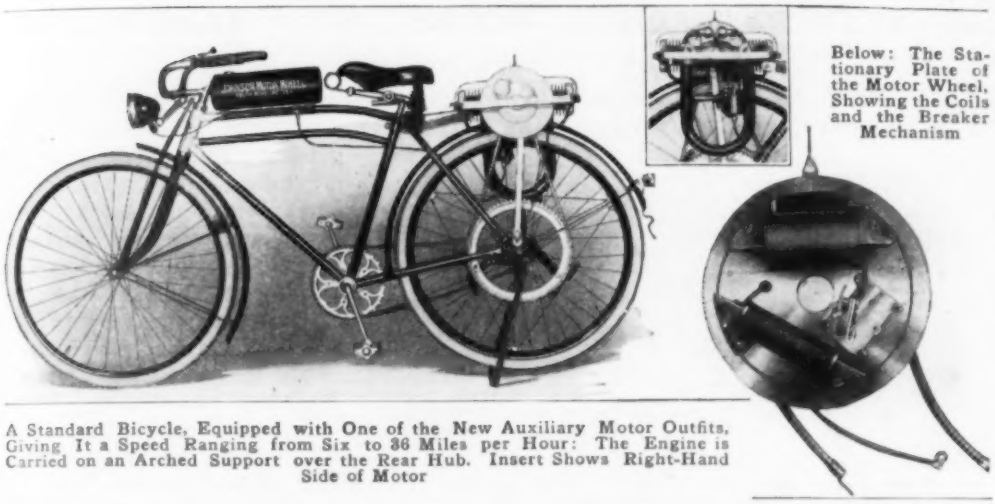
¶On an incline in a Pennsylvania park a flag, measuring 8 by 12 ft., has been constructed of concrete. It stands between two cannon and its colors are well reproduced. A pleasing effect has been produced by raising the white stars on the blue field.

WHOLE OF AUSTRALIA STIMULATED BY WAR

Although far from the battle front, the changes which are taking place in Australia at the present time are remarkable indeed and indicate how a continent can fight heroically and at the same time labor constructively for a larger life in the coming years of peace. One great lesson which the commonwealth has learned is that it cannot afford to be so largely dependent on outside means for commercial intercourse with the rest of the world. With enormous surplusage of wheat, wool, sugar, beef, and fruits, the people of this far-away country have been unable to furnish them to the mother country, which needs them sorely. With the coöperation of the government, great shipbuilding enterprises have been launched and ports are being improved. The output of the Australian metal industry for the next 10 years already has been contracted for. The textile and sugar industries are being expanded. Better facilities are being sought for marketing the enormous quantity of wool grown in this sparsely populated country. The government is aiding in extending the export business in butter, beef, and cheese. A conference has been held at which plans were made effectively to coördinate all these efforts at expansion.

SIMPLE POWER OUTFIT MADE AS BICYCLE ATTACHMENT

Interesting points and convenient arrangement are found in an auxiliary power equipment that has lately been developed for the purpose of converting an ordinary bicycle into a motorcycle. The motor is a two-cylinder, horizontal-opposed one of very low fuel consumption and only 25 lb.



Below: The Stationary Plate of the Motor Wheel, Showing the Coils and the Breaker Mechanism

A Standard Bicycle, Equipped with One of the New Auxiliary Motor Outfits, Giving It a Speed Ranging from Six to 36 Miles per Hour: The Engine is Carried on an Arched Support over the Rear Hub. Insert Shows Right-Hand Side of Motor

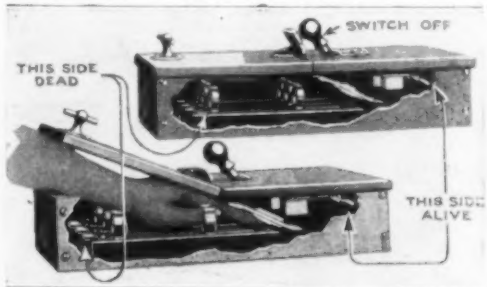
weight. It is mounted abaft the seat over the rear wheel and so carefully balanced that it is said to be practically vibrationless when in operation. A speed range of from 6 to 35 miles an hour is afforded. The chain drive is direct from the engine to the wheel through a shock-absorbing driving sprocket. The motor is rated as having one and a half brake horsepower, and has but seven moving parts. The carburetor has no moving parts and needs no adjusting for the entire range of speed. Another interesting feature is that its crankshaft is made in one piece.

SWEDEN'S NEW RADIO PLANT SENDS MESSAGES FAR

At Karlsborg, Sweden, the most powerful radio station in that country has recently been put into operation, establishing direct communication with many distant points, including cities in Spain and Austria, and Constantinople. A small station in Damascus, Palestine, also reports picking up a message from Karlsborg, but because of its own limited range was unable to reply. The masts of the new plant are 684 ft. high and weigh 25 tons each. They are insulated at four different places from base to top and are set in granite blocks. The aerials are 1,476 ft. long.

SWITCH HAS AUTOMATIC SAFETY FEATURES

For use as a knife switch in mills, factories, etc., where men are employed who are unfamiliar with electricity, inclosed switches are being made which, by reason of automatic features, practically eliminate all danger of accident arising from their use. The front lower half of the shallow steel box in which the switch is contained consists of a hinged door having a special latch at its lower edge. Projecting from the upper half of the box is an arm of the toggle type, so connected with the latch that the former must be thrown into the "off" position before the door can be opened. When the box is opened all exposed parts are dead,



New Safety Switch Box Closed and Open: The Door cannot be Unlatched Until the Toggle Switch is Set in "Off" Position

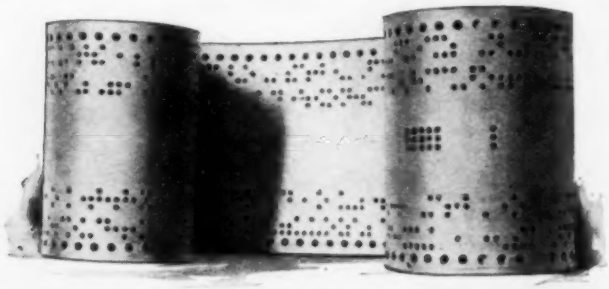
while the live parts, placed in the upper half of the case, are out of reach.

EMBROIDERY MACHINE WORKS LIKE A PIANO PLAYER

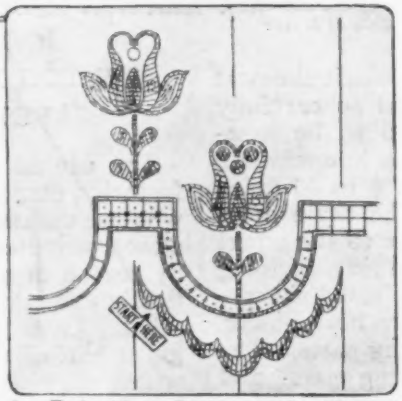
By WILLIAM D. GOODWIN

NEARLY all of the embroidered and lace articles used in the United States were formerly made in Switzerland and Germany. At the present time, however, there are many automatic machines used in this country turning out thousands of yards of embroidered neckwear, handkerchiefs, plain embroidery of all descriptions, laces, and combinations of lace and embroidery, made of cotton, silk, or metal. The newest device for doing this work is an automatic shuttle machine, the automatic attachment for which is the product of an American inventor, the embroidery machine being created by an ingenious Swiss. Although 55 ft. long, 8 ft. wide, 12 ft. high, and weighing 20 tons, it is as carefully adjusted in all its many parts as the mechanism of a watch. Two rows of needles extend the entire length in front of the machine, one above the other, making a total of 1,024 needles, with an equal number of shuttles in the rear. As the needles pass through the cloth, held upon beams spanned on the frame, the shuttles go through the loops formed by the needles, the combined operations of the needles and shuttles being about the same as the work of needle and shuttle in a sewing machine. The needles always perform the same function, the cloth being moved up or down when the needles do not touch it. A design is duplicated many times the entire length of the cloth, upon the surface of which the design is being made. The frame is operated by an automatic device, the functioning of which is guided by a perforated card similar in appearance to that used on piano players.

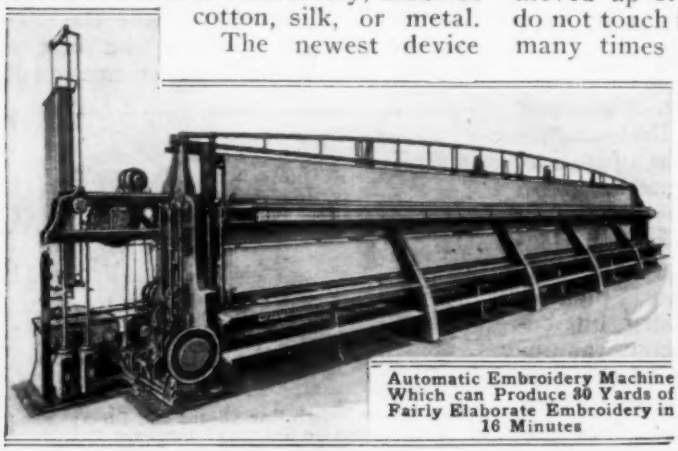
The pattern to be embroidered is first drawn carefully upon paper six times larger than the actual work will be when finished. This is fastened to a pattern board on the front of a



One of the Perforated Rolls, Which is Placed in the Machine to Control the Operation of the Embroidery Needle: The Roll for the Design at the Right Contains 2,170 Holes and Is 33 Feet Long

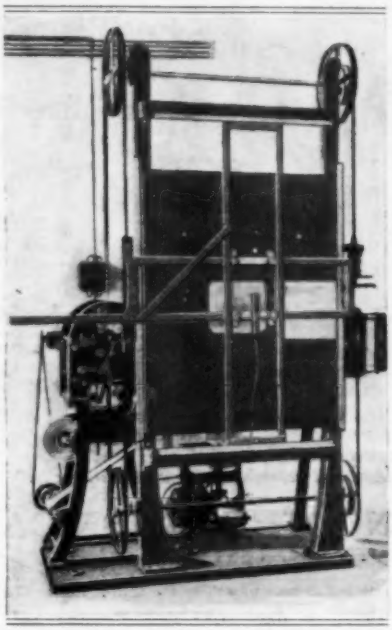


An Embroidery Design to be Worked Mechanically: The Originals of Such Drawings are Made Six Times Larger Than the Finished Work



Automatic Embroidery Machine Which can Produce 30 Yards of Fairly Elaborate Embroidery in 16 Minutes

punching machine. Each line in the design is accurately traced by an expert by using a pointed handle. Following each movement by the operator, a button on the handle is pressed which brings the little steel punch of the mechanism into operation, producing holes in a long strip of cardboard. The perforated card required to embroider the design shown in one illustration has approximately 2,170 holes and is 33 ft. long. A roll of this length is punched in about 40 minutes and it can be used for making about 100,000 yards of embroidery. It takes 16 minutes to produce 30 yd. of embroidery of the pattern shown, the machine being run at the rate of 135 movements per minute. Two operators are required to run each machine, one looking after the needles and the other attending to the shuttles.



The Punching Machine with the Board, in Black, to Which the Pattern is Attached

Another phase of the work of this remarkable machine is illustrated by beautiful pieces of rose-point lace which are produced by it. These delicate creations are fashioned by using cotton thread on a special fabric which is made of animal fibers. On the completion of the pattern the whole is boiled in a solution containing caustic soda which destroys the cloth, leaving the threads which have been woven mechanically into a rare pattern. It would seem that the possibilities of this invention are almost unlimited.

DEPTH TO WHICH DIVERS CAN SAFELY DESCEND

The fact that oxygen when subjected to sufficient pressure, becomes poisonous to breathe, limits the depth to which a diver can go with safety. It has been found that 297 ft. below the surface of the water there is real danger for the diver from oxygen pressure, if he remains at that depth long. Investigation also shows that 1½ cu. ft. of air per minute is the minimum supply with which a man can breathe and work.

"SALUTE AND RIDE" LABELS ON CARS AID SOLDIERS

Many a motorist is pasting a red, white, and blue label on his windshield, bearing the words "Salute and Ride." It signifies that the driver of the car will stop and take on any man in uniform who manifests his desire for a ride by saluting. The plan makes easy the performing of a courtesy that is often much appreciated. No driver is expected to go out of his way for a man in the service, and it is not expected that the latter will signal to a car already full.

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This Label on a Windshield Means That the Driver of the Car will Stop and Give the Soldier a Lift

"Then the color sergeant of the first battalion flung out Old Glory to the breeze, and a roar of surprise, wonder, and heart-felt welcome shook the city."

ORGANIZING THE AMERICAN SECTOR

By BRANDON TRACY

The text of this article has been passed by the United States Chief Military Censor

ON the 27th of June, 1917, a fleet of transports under heavy convoy docked at a harbor of France. A stream of khaki-clad warriors issued into the streets of the old seaport town, and unostentatiously marched, in columns of four, out to their first rest billet abroad, an empty Canadian training camp.

The French citizens viewed them wonderingly as they passed. "Portuguese? No! The Portuguese wear no such hats, and besides, they are not so big and *white!*"

Then the color sergeant of the first battalion flung out Old Glory to the breeze, and a roar of surprise, wonder, and heart-felt welcome shook the city.

"Les Americains!" If there remained indoors a single French citizen able to walk or be pushed in a wheel chair that day, history fails to record the fact. Shopkeepers dropped their prospective customers, the latter deserted their bargains, mechanics came with tools still in their hands, cripples hobbled out on crutches, and mothers brought their tiny children to swell the unending chorus, *"Bon accueil, nos amis!"* Never has there been a more enthusiastic welcome given to a band of soldiers than was received by Pershing's men that memorable day. It was more than a pledge of coming assistance from the greatest nation in the world, to needy France. It was an omen, the prelude to the overture of victory that then looked as if it might never reach the first chord, and besides this, it was the return of a kindness and friendship given by France 141 years before to the struggling American republic.

Twenty-eight thousand soldiers landed in France that day. According to the statement of the commander of the port, over 300,000 more followed them through this one port between the first of July, 1917, and the first of March, 1918. The total number arriving at other ports is not known exactly. Out of the total number of American troops abroad, on March first between 50,000 and 60,000 were holding a 12-mile sector of trenches in one region. What has been done with the others?

It is difficult for the average person in civil life to understand why nine-tenths of the first million of United States troops can not be thrown on the firing line immediately their training is completed. The argument seems to run like this very often: "Our boys are sent over there to fight. There is a bunch of them over there now; we know that. Why aren't they fighting?" And the speaker feels honestly that he is exposing inefficiency.

The reason is simply that United States troops were not summoned to stop a wide gap in the defenses as were "Kitchener's Mob" and the ill-prepared but gallant-to-the-death detachment of Canadians who flattened themselves into the mud of the Marne and held the Hun at bay until only nine per cent of the thin line remained. Because of the desperate drive the Germans are making upon Hazebrouck, Bethune, Amiens, and Ypres at the time of writing, a portion of

the American legions are being used for reserves along the threatened line, but this is emergency service, out of line with the general plan for the employment of our troops. While these reserves are being used, the work of establishing our sector of the line goes steadily along.

The best answer to the impatient citizen who thinks he sees his country dawdling away precious time, is that the problems involved in preparing a sector of line so that millions may be taken to the trenches in the course of from two to three years, is a problem in engineering and mechanics that dwarfs even the Panama Canal project. The citizen sees only the lines of trenches and the batteries of artillery backing them up. These are but the flower and fruit of the tree whose roots seek out every corner of France and England, and are now stretching across the sea to this country.

No one outside of the War Department knows exactly how many of our troops now in France are engineers—the best lay estimates place the number at between 120,000 and 150,000. Suffice it to say that there is one particular branch of engineers for each variety of construction taking place. Many of these have from six to ten subdivisions, each with a further specialized task. These men are in no sense of the word slackers. Many work under perpetual shell fire. Some face rifle, bomb, and machine-gun fire. All are engaged in a work that is essential, that their brethren of the infantry and artillery may carry on a successful campaign.

On March first of this year, between four and five divisions of American troops occupied a certain 12-mile sector. Because this quiet spot on the lines had been defended previously, Pershing's command found a part of the pioneer work accomplished, yet the stupendous task remained of replacing the French system gradually with one wholly American.

Though the various branches of engineers worked simultaneously, we will consider them in turn, working backward from the front.

The "pioneer branch," as it is known, has charge of all constructive endeavor taking place Berlinward from the third trench of the first lines. The first duty on this sector was to set up new barbed-wire entanglements according to Pershing's specifications. This work, just as the digging of new trench lines in No Man's Land, took place at night. Placing wire along a sector of front is always a task at which the engineers are perpetually trying to outguess the enemy. The reason for this is that barbed-wire entanglements are placed not only to make the enemy's attack more difficult, but also in a way that will allow the defending force to attack quickly and without impediment when such action is desired.

Various devices to facilitate this have been used in the past. The first was a system of camouflaged sortie gates through the wire, so placed, diagonally, that they could not be seen by the enemy, but were known well to the defenders, of course. These worked for a time until airplanes, flying low, were used for spotting them; after this they presented little more difficulty to the attackers than to the defenders.

Second came the "collapsible fence." This was a straight entanglement, so arranged that in one spot, or several, it could be dropped by pulling away certain supporting pickets. For some reason, probably because the wire still presented something of a hurdle even when dropped, this has been abandoned.

Last came the system that now is in favor with both the allies and the Germans. This consists in laying the wire with certain strands only lightly attached at the sides of the prearranged sortie gates. When an attack is to take place, cannon fire from immediately behind the lines blows the gates open, hurling the wire out into No Man's Land, or in some cases even into the German trenches. A modification of this was tried by the French, namely, mining the spot below the gate, and then blowing the wire into the air, but this was not considered practical, because it often dropped the wire in the path of the attacking force, and because it excavated such a crater that getting through was almost as difficult as if the wire were in place.

Another subdivision of the pioneer branch took charge of the construction of traverses, communication trenches, reconstructing present trenches, and building listening posts. Because the French had been using all their available strength to the northward, this part of the work was huge, though by no means as monumental as the building of an entirely new system. In the main it consisted of deepening the trenches—the French, owing possibly to their short stature, use six-foot trenches nearly everywhere, while the British, Canadians, and Americans believe in having their ditches from seven to ten feet in depth wherever possible — strengthening parapets and paradoses, and roofing the laterals leading to ration and ammunition dumps with corrugated iron.

The sappers, another subdivision of the pioneer corps, took over the construction and maintenance of dugouts, communicating saps, lateral saps to the listening posts, and the mining of positions both below the fire trench itself, and under the enemy defenses.

Little of the latter was done, since this properly belongs to offensive operations, for which the United States detachment was not yet ready. Two lateral saps were placed, however. These are tunnels parallel to the fire trench at different levels below the ground and a few yards nearer the enemy. Their purpose is to intercept any enemy sap which may have for its goal the placing of a mine somewhere underneath the American defenses. From these

lateral saps many short tunnels extend downward and forward, ending in little chambers like subterranean listening posts. They are, in fact, listening posts, for day and night they are occupied by microphone operators, whose sole business it is to detect the first faint "Pick! Pick!" of the opposing sappers, and to locate the exact point of the enemy operations so that a defensive mine can be exploded exactly where it will account for the underground attackers.

Immediately behind the first lines of trenches the engineers work under conditions of grave danger and difficulty. This zone is continually under shell fire. Even in a quiet sector a desultory rain of shrapnel, H. E. shells, whizz-bangs, pip-squeaks—the latter two being four and nine-inch shells, respectively, which are known commonly by these names because of the noises they make—keeps life and endeavor uncertain.

"The duck-road crew now is a permanent institution back of the American lines. These men fill in new shell craters in the way of transports, and straddle the muddy places with plank roads. Because in certain seasons of the year there are no dry spots between the mud holes in France, the continuous plank highways these men build are known as duck roads."

In the first mile back of the American sector in France three main branches of the engineering corps started work. These were the motor-transport, the duck-road, and the "pushway" sections.

Because supplies and ammunition must be kept coming up in a steady stream that the fiercest bombardment cannot halt, this mile of ground is taken care of tenderly. Roads for the motor transports from the railheads to the third-line trenches are under constant construction and reconstruction.

The duck-road crew now is a permanent institution back of the American lines. These men fill in new shell craters in the way of transports, and straddle the muddy places with plank roads. Because in certain seasons of the year there are no dry spots between the mud holes in France, the continuous plank highways these men build are known as duck roads.

The motor-transport engineers have actual charge of all the trucks operating in this area. They oversee the repair and reconstruction of such as may be damaged, and see that sufficient are on hand to take care of all the work that has to be done with trucks in all parts of the line. The latter is a job calling for constant alertness, sagacity, and ingenuity, for at any moment units that have been counted upon to perform specific duties may meet one of Fritz's aerial emissaries and cease to exist from that time forth.

Because it is impossible to camouflage a motor-truck transport train or a steam engine sufficiently to deceive the enemy airmen, the pushway section has its being. The pushway itself is simply a narrow-gauge railway such as miners use on the lower levels for transporting cars of coal by hand. On the tracks small loaded cars are pushed from the railhead of the nar-

row gauge up to the dumps at the back of the trench system.

This would be exceedingly hazardous work were it not for a feature invented last year by the engineering corps. The roadbed of this pushway is excavated vertically and sidewise, so that the tracks run in what is virtually a shallow sap, covered above and on one side from detection by enemy fliers. In some vital portions the third side is covered also, by thatches on which ordinary mud is thrown. This makes the pushway invisible to the enemy from any vantage point. The only mishap which then can occur is a direct hit by a chance shell; this does occur often, however, so the pushway section is kept on the jump always during a bombardment.

From one-half to three miles back of the third trench the artillery is located. In the American sector these batteries are manned entirely by United States troops, but the guns used have been the French 75 and 145-millimeter pieces, exclusively. Incidentally, the marksmanship of American batteries has proved so good that dozens of batteries, equipped in this way, have been used on the more northern fronts.

One division of the engineers has charge of the placing of American batteries in this region. The work requires an intensive study of the terrain, plus a knowledge of the various objectives. Besides these features, the engineers take care of the work of camouflage, making the batteries invisible to air craft wherever possible.

Immediately behind the head of the pushway comes the vast network of narrow-gauge steam railways that link up the forward points of a sector with the bases. The engineers who have this in charge, the last of this body to work under constant shell fire, are known as the "light-railways division," to distinguish them from the "heavies," who run the standard gauge yet farther back. In actual operation these two sets need no particular description; their work is exactly similar to the work on any military roads. In taking over the sector, American engineers had to lay new track for both of these sets, connecting the railheads with new bases.

The regular roads link up every portion of France not held by the Germans with all the sectors. They lead back to the base hospitals. They touch the forests where the forestry engineers are at work, supplying timber for all the multitudinous uses of warfare, and give access to ammunition depots and quartermasters' warehouses.

So far, 22 base hospitals have been put in operation for the use of American troops. These range in size from the smallest—200 beds—to the largest which contains over 15,000 beds. Other large ones are within a 50-mile radius of this.

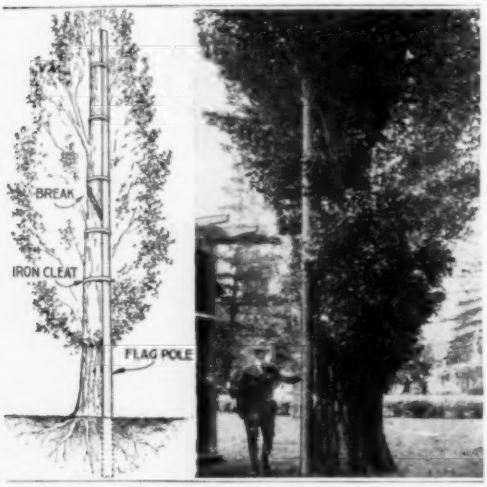
These hospitals are all in charge of American doctors, and by the time they are in use for our boys they will have none but American physicians and surgeons. The mistakes and lacks of the first two bitter years in England and France are not to be repeated with our hospitals in the sector; that is certain.

This is but the briefest accounting of the gigantic task that reached its first stage of completion when American troops definitely took over the 12 miles of line. The work is moving forward constantly. The sector of trenches is being widened as rapidly as is consonant with the training of our new units.

"From one-half to three miles back of the third trench the artillery is located. In the American sector these batteries were manned entirely by United States troops, but the guns used have been the French 75 and 145-millimeter pieces exclusively."

STEEL-FLAGSTAFF SPLINT SAVES BROKEN TREE

A shapely poplar tree in a city park, which appeared to be doomed when its entire top was split by a wind-



Flagstaff, Clamped to the Tree Trunk Like a Splint, is Enabling This Poplar to Recover from a Windstorm Which Nearly Broke Off the Top

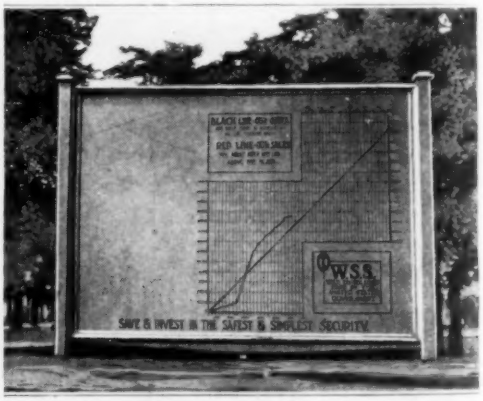
storm, has been saved by the use of a supporting splint made from an old flagpole. The trunk was so badly broken that the top was left hanging by the bark only. The city forester treated it much as a surgeon would a fractured bone, fastening the 8-in. steel flagstaff to the straightened trunk with strong clamps and supplementing this with two other heavy splints. When the break has entirely healed the supports will be removed.

NEW TESTS SHOW LAUNDRY CHEMICALS INJURIOUS

In Germany, where soap is practically unobtainable at present, it has been disclosed by a chemist of prominence that compounds such as sodium perborate are destructive when used in laundering soiled cotton and linen garments. Oxygen-liberating chemicals of this character have been used because of their ability to cleanse clothing without requiring it to be rubbed vigorously, as when soaps are used. It has been claimed that their employment was not injurious to textile fiber. This has been borne out by laboratory tests. But it now develops that the tests were not thorough. Instead of studying the effect of the chemical action on soiled cloth, new, clean cloth was invariably used. And while the results of the experiments were favorable, the fact remained that the life of garments deteriorated rapidly in practice. The recent investigations have disclosed that free oxygen has a different effect on some soiled cloth from that on clean material; and particularly is this true when oxygen carriers, such as copper sulphate, stain the cloth. It is shown that particularly when copper sulphate comes in contact with iron stains, holes are eaten through cloth during the first washing.

WAR-STAMP CAMPAIGN AIDED BY COUNTY SCORE BOARD

Facing the main street in Charles City, Ia., a large billboard has been erected to record from week to week the progress of the War Savings Stamp campaign in Floyd County. Across its plotted surface extends a black line indicating the district's quota, which amounts to $365,000 for the year. A second line, a red one which is extended weekly, registers sales to date.



Facing the Main Street of the Town, as It Does, the Score Board Attracts Attention and Stimulates Community Pride as Well as Interest in the War-Fund Compaign

Longitudinal marks represent time, and horizontal ones dollars. The board keeps interest in the campaign agog.

EASTERN RAILWAY MAKES NEW FREIGHT RECORD

A total of 9,531 freight cars passed through Columbia, Pa., on the Pennsylvania lines June 20th, making a record for that road and, it is believed, a world's record as well. On several other days in June the volume of traffic was almost as great at this point, through which passes practically all the east and west-bound through freight. The total of 250,322 cars for the entire month exceeded that of any previous month in the road's history. These cars, if placed end to end would fill a double track extending from New York to St. Louis. Another statement illustrating the magnitude of this total is that each day of the month an average of 70 miles of freight cars passed through Columbia. Roughly, the equivalent of 40 vessel loads of 5,000 tons of freight each passed this point daily. All of these figures indicate something of the tremendous burden that the war has placed on the railroads, particularly in the East.

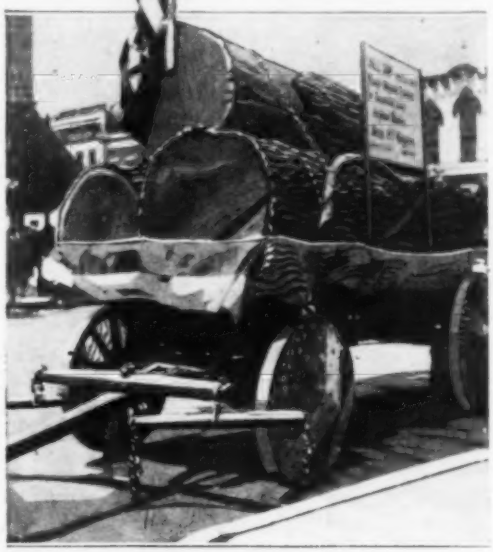
MACHINIST'S BENCH VISE OF NEW DESIGN

A bench vise for machinists and mechanics which departs in design from ordinary vises is now being manufactured. The old-fashioned screw and lever are replaced by a pawl and rack, actuated by a handle on an eccentric shaft, so that many times the pressure possible with a screw can be obtained, it is claimed. The vise can be removed from its swivel base and transferred to a surface plate, drill press, or other machine, if desired.

¶A timesaver for a force of draftsmen is an eraser mounted on the end of a 3-ft. flexible shaft, which is driven by a one-fifteenth horsepower motor.

BEDECKED LOGS ADVERTISE NEED OF BLACK WALNUT

In many parts of the country farmers are responding to the government's appeal for black-walnut timber, so much needed in making gunstocks and aeroplane propellers. That the patriotic aspect of this demand might be emphasized



Patriotic Float Containing Three Valuable Black-Walnut Logs to be Used in Making Gunstocks and Aeroplane Propellers: The Placard Ask for More Such Logs

to the farmers trading in a middle-western city, a load composed of three fine logs, one of them about three feet in diameter, was decorated with bunting, flags, and placards and drawn through the city.

PNEUMATIC MAIL TUBES USED NO LONGER

The government has discontinued the use of the pneumatic mail tubes which have long been used in New York, Chicago, Philadelphia, St. Louis, and Boston, the claim being that they no longer promote the most efficient postal service. The limited capacity of the tubes and the introduction of fast motor trucks are among the reasons given for discarding the pneumatic equipment.

WOMAN CROCHETS FLAG TEN FEET LONG

A product of skilled handiwork which arouses special interest in these days is an American flag, 10 ft. long,

A Remarkable American Flag Crocheted by One Woman in Three Months' Time: The Emblem is Made of Eightfold Yarn and Is 10 Feet Long

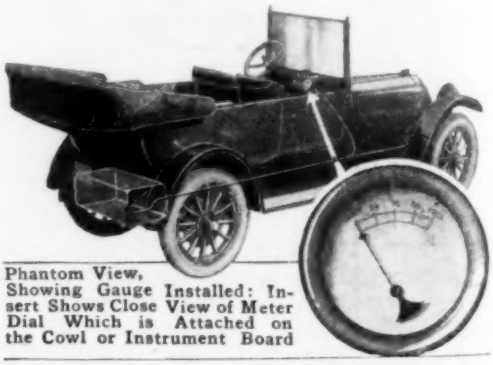
which was crocheted by one woman, who devoted her spare time to the task for three months. Eightfold yarn was used. Draped upon the wall or over a doorway, the soft, heavy folds into which the emblem falls produce a very beautiful effect. The five-pointed stars stand out with unusual prominence because set in open squares with only their tips attached to the surrounding fabric.

FIBER "WOOL" IS OBTAINED FROM SWEDEN'S PEAT BOGS

Peat "wool" is the new substitute material that is drawing the attention of the textile industry in Sweden and Denmark. A company has of late been formed to undertake its manufacture. A plant is being established in the province of Småland for spinning peat fiber to be obtained from the large bogs of that province. At Göteborg another factory is being built to further treat and then card, spin, and weave the material. When mixed with 30 or 40 per cent of wool, and woven, it is said that a fabric is produced that is hardly distinguishable from cloth made of pure wool. So far as strength is concerned, the wool-fiber thread is able to sustain 28.7 lb. in comparison with 19.8 for wool thread. Peat wool seems to be particularly suited for mattings, carpeting, and can be produced at about five cents per pound. The cost of about six pounds of material containing one part clean wool and two parts fiber wool will be about $2.36, it is believed.

GASOLINE GAUGE FOR CAR HAS DIAL ON COWL

For motor cars a fuel meter that operates similarly to a steam gauge, has been introduced. Essentially it consists of an auxiliary cylinder that is screwed into the tank drain and connected, by a copper tubing, with a recording instrument installed on the cowl. The pressure created by the weight of the gasoline in the auxiliary chamber acts on a sensitive diaphragm that actuates the indicator. Compensation for the expansion and contraction of air in the tube is taken care of by the provision of an air compartment in the cylinder attachment.



Phantom View, Showing Gauge Installed: Insert Shows Close View of Meter Dial Which is Attached on the Cowl or Instrument Board

COMMENT AND REVIEW

IT seems inherent in the human mind to want something for nothing, and the less trained the mind, the more possible it appears to achieve this result. About every so often, like the irregular appearance of 17-year locusts, a new scheme breaks out, for producing real power from nothing, or a great deal of power from so small an atom of fuel as to be practically none at all.

Something for Nothing

Even perpetual motion still has its sincere believers as evidenced by the frequent letters received by this magazine, and other mechanical publications. It has, perhaps, never before occurred that Congress actually appropriated money for the investigation of such an effort as Garabed. However, in the present instance there was some measure of promise, as the Garabed system claimed special apparatus for condensing from the air a fuel gas. With the practical accomplishments of wireless in the air, and the recovery of nitrogen from the air, there was the possibility that a battleship might draw its own supply of fuel from the air, as needed; at least, in the absence of any knowledge of the inventor's process, no one was prepared to declare it could not be done. The stakes were so high Congress was justified in appointing a commission to investigate.

The result of the investigation by able scientists, however, was that the scheme was a failure both in principle and practice, and so Garabed goes to its repose with the Keeley motor of the 70's, but without having fleeced an army of hopeful stockholders.

WE were all so enthused and delighted over the world-breaking record of the big splash on July 4th that some of us may fail to grasp the tremendous potentialities of which the big splash is only a ripple.

Vast U. S. Merchant Fleet

Chairman Hurley, in a recent address, stated that when the shipbuilding program for 1918, 1919, and 1920 is completed, the United States will have jumped from less than 500,000 tons flying our flag in over-sea trade, to the stupendous merchant and passenger fleet of 25,000,000 tons, the largest merchant fleet in the history of the world. And not only the largest, but the very latest, embodying the last word in ship construction and equipment.

The German gospel of frightfulness which was to make her the ruler of the seas by sinking the ships of all other nations—has now turned turtle.

But for this, our country would doubtless have continued on indefinitely with only enough ships to carry 10 per cent of our own over-sea trade, and contentedly paying freight on the remaining 90 per cent to other countries, of which Germany was receiving a very large share. Should, for many years to come, any American be so unpatriotic as to ship in German vessels, Congress should reward him with a special, heavy tax, on every pound so shipped.

Although a great tourist nation, our travelers have had but a mere handful of American ships in which to cross the Atlantic or Pacific, and none whatever to the east or west coast of South America, or to Australia, India, or Africa. The American traveler entering almost any port in the world found the flags of all seaboard nations except our own.

Von Tirpitz has made this no longer possible, for the ships of the American merchant marine will within 36 months dot the waters of the earth and our flag will become a familiar, and we hope a welcome, sight in every harbor in the world.

One year ago the shipyards of the United States employed less than 45,000 men; today there are over 300,000; by 1920 there will be close to a million men building our ships and their equipment. What this vast army of enthusiastic skilled men, with American ingenuity, labor-saving devices, organization, and general ability to do things, means, no one but ourselves fully realizes—least of all Germany, who still tells her people we are only bluffers.

What this sudden expansion in sea tonnage—as sudden almost as an explosion—means in the development of export trade, and a closer acquaintance with other

nations, many of whom know us now only by hearsay, is too great to be set down here in a few words. It will require some changes in our manufactured articles to meet their wants; it will bring us many desirable things we have never had; it will mean the special training of thousands of young men who will go out to represent our merchants; but above all else, it will demand the exercise of the highest code of business honor, without which all other advantages must fail. As the nation which went out to battle solely for principle and in no sense for profit of any nature, the doors of the world will open to us. It will be the opportunity of a thousand years. We must not fail to be worthy of that opportunity in every way.

GREAT disasters such as vast conflagrations, tidal waves, plagues, and earthquakes immediately discover the genuine knight or knave; and the war, like a great volcano in continuous eruption, constantly brings out these contrasting national traits.

Disasters Disclose National Traits

When the Zeppelins were full of promise, and Germany expected to make London a heap of brickbats; and while the Red Cross symbols of mercy serve only to attract bombs from German airmen, and defenseless hospital ships are targets of special delight to German submarines, any word of protest from outraged civilization is met with contempt and scorn by the enemy. Their answer has been and still is, that any act, however brutal, that may lend success to their arms, will not be neglected And so, for nearly five years, they have steadily climbed the mountain of arrogance, and having reached its peak, are starting down the other side into the valley of defeat. Already fragments of the once fearsome Zeppelins strew the shores of the channel which proved their river Styx; already more than half of the submarine fleet has become the home of crawling things which live at the bottom of oceans; and the air craft tumble night and day in a steady stream of hopeless wreckage.

And now after years of military debauchery extending from the heights of the heavens to the depths of the sea, and finding its own arm shortened and palsied, and realizing the arm of the allies is daily gaining strength, this valiant (!) people, like all other bullies, begins a sentimental whine, and suggests a mutual agreement against bombarding towns outside the present fighting zone.

The vision of a sky dark with fliers who will spread their wings in America and drop their messages of destruction over Berlin and every other German city, is just beginning to dawn upon them. As they planned to conquer the world, so the world must first conquer them, before the arrogant Prussian can be expected to regard the rights of others, as honorable nations do. When peace comes, it must not be written on any scraps of paper, but be so carved into the very heart of the aggressor that the lesson can never be effaced.

To accomplish this, regrettable as the effort is, no sentimental notions of easy forgiveness should be permitted to warp our judgment or becloud our vision, as to the real nature of the mind and spirit of the colossal offender with whom we have to deal.

The allied world prays for peace, but only for the right kind of peace, for any other would prove only a disappointing mirage. The time-worn doggerel is still true, that

When the Devil was ill, the Devil a Monk would be;
When the Devil was well, the devil a Monk was he.

IN contrast to the spirit of German Kultur, witness the attitude of a colony of 450 Chinese, who in peril of their lives followed our forces out of Mexico, into Texas. Interned under the exclusion act, and treated as prisoners of war, although voluntarily such, these Chinese refugees were taken to Fort Sam Houston and Camp Travis. At their own request they were at once assigned to useful occupations about the camps, where, with usual Chinese efficiency, they have made good. From their wages they have already endowed a bed in the American hospital at Neuilly, France; have contributed liberally to our Red Cross fund; and have bought Liberty bonds and thrift stamps, while many of them have tried to enlist in our Army as fighters.

A Pleasant Contrast

Ship Them Home

WHAT to do with those several thousand Kaiserites in this country is worth thinking about. With German deleted from the public schools, and the near prospect of no beer, life here will lose all charm for them. And probably they never wanted to come anyway. Seems as though they must have been shanghaied, or chloroformed, or mesmerized in order to leave all the advantages of the fatherland and the Kaiser, for the disadvantages of the U. S. A. and President Wilson. It is true most of them have prospered far beyond any possibility of what they could have done in Germany. But what of a mere detail like that! It is also true that since they have been obliged to live the exclusive life set apart for internes they are more of a liability than an asset to us, really a liability net, with no chance for realizing anything on them in the end.

And they are so homesick for the fatherland; yes, in spite of good meals and warm shelter and comfortable beds, with nothing to do but rest and enjoy life, yet do they long for home. It does seem a bit unhospitable to force our unwilling guest to remain in one's house when that guest is pining to be on his way.

So far the ferry which crosses the pond has been busy owing to a sudden expansion in the tourist business. Americans, many of them young men who never before had thought much about a European trip, have crossed the ocean in numbers breaking all former records. And the desire to go has reached all parts of the country, even to the most remote places. Naturally we must provide for our own people first, and so the internes have had no opportunity to sail.

However, there seems just now to be a sort of revival in the shipbuilding business, and in the very near future there will be plenty of ships for everybody. Wouldn't it be splendid to celebrate the event with a grand coming-out party for those now interned at Ft. Leavenworth, et al. Even so fine a state as Kansas might easily become tiresome under such circumstances, and a change will surely benefit all concerned—the leavers and the left. It might be necessary to hold enough of the passengers' property in this country to indemnify the possible non-return of the ship, but surely between the Kaiser and Gott and his sea lord some symbol might be provided which would pass the vessel into a German port and out again, so she can hurry back and fetch another load. Naturally most of the men folks would want to get into the German army right away, but doubtless even that could be arranged for, as there surely must be some vacancies by this time; and the women could help in the Cabbage Aid Society, and such. And besides, it would be nice for them to be in Berlin in time to witness the grand parade of the Sammies and their allies, which is sure to occur even though the date is not yet determined.

If I were a congressman it would be hard to conceive a greater satisfaction than to introduce a bill which would provide this pleasant excursion on the water for these poor shut-ins.

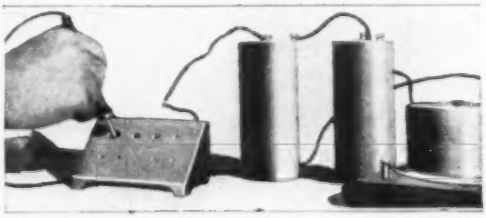
Moreover, they are entitled to pass out through Castle Garden where most of them entered, but to avoid unnecessary offense the ship might have to sail after dark, and even then the blaze from the Statue of Liberty is extremely trying for certain kinds of eyes.

And having passed out of the Land of Liberty and Opportunity, which such as they can never appreciate nor understand, let the door swing shut, never again to open for one of them.

H. H. WINDSOR

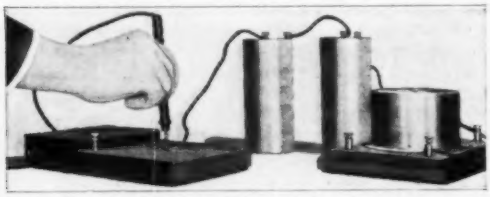
ODD INSTRUMENTS ARE USED TO TEST WOMEN WORKERS

Two electric instruments have been devised to determine the fitness of women for difficult machine work that demands perfect muscular and nerve control, as well as high resistance to fatigue. The operating board of one of them contains a series of holes of



Beginning with the Largest Hole, the Subject Attempts to Insert the Stylus in Each Opening without Touching the Metal Walls

graduated size, lined with metal and connected in an electric circuit with a stylus. The girl under examination attempts to insert the point in each



The "Tapping Machine" Determines Resistance to Fatigue and Has One Hole with a Small Metal Disk Fixed at Its Bottom

of the holes, from the largest to the smallest, and hold it there without touching the metal. If a contact is made, however, the fact is registered by a recording machine. The result of the test indicates the subject's degree of control. The other instrument has a tiny metal disk at the bottom of a hole. This is supposed to be tapped with a stylus for a protracted period. Each time the point misses the disk and strikes at one side of it, a record is made electrically. In this simple way, accuracy and endurance are measured.

ELECTRIC CAR JUMPS TRACK AND FALLS INTO RIVER

Several persons were killed when a trolley car left its track on a very high bridge near Akron, Ohio, recently. The wooden floor of the structure gave way instantly as the weight was thrown on it, and the car, turning end over end, plunged many feet to the river far below. Of the six passengers carried, four were instantly killed.

TO FABRICATE MORE STEEL NEAR SHIPYARDS

The government proposes to increase the capacity of eastern steel-fabricating plants greatly and thereby save time and relieve the railroads of carrying quantities of steel for shipbuilding to shops long distances from the mills. What a great burden the country's transportation lines have been under may be gathered from the fact that much of the steel for fabrication has had to be shipped as far west as Omaha, as far south as Roanoke, Va., and north to Toronto and Montreal. While the country's estimated capacity for fabricating steel is 180,000 tons per month, the largest plants are in Pittsburgh and Chicago, and even the former point is too far from the yards at Philadelphia and New York, and other Atlantic ports, for economical handling of materials destined for new ships. Furthermore, many of the plants in this country are equipped to fabricate shapes rather than plates, though the greatest need by far is for the latter. The Emergency Fleet Corporation plans either to increase the capacity of the shops to fabricate plates or to build new ones.

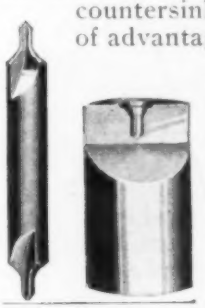
The Floor of the Bridge Gave Way, as Shown in the Picture at the Left, and the Car Plunged to the River, Where It is Shown Bottom Up and Nearly Submerged

TRY NEW PREVENTIVE FOR RABIES

The production of a new serum with which animals and man can be made immune to rabies may result from experiments recently conducted by a French scientist. The brain of a rabbit which had died of rabies was treated with sulphuric ether and then mixed with a special preparation, forming an emulsion. By injecting a weakened solution of this emulsion under the skin, immunity to rabies has been produced which appears to be both lasting and effective. No bad effects, it is said, result from giving the injection. The serum has, so far, only been tried on animals.

CENTER DRILL-COUNTERSINK SAVES WORKMAN'S TIME

Both time and labor are saved by the use of a combined center drill and countersink that has a number of advantageous points. The instrument enables the facing of work to the center without employing half centers or necessitating withdrawal of the tailstock center. Furthermore one end or both of them may be faced either before or after the turning, as the operation has no effect on the actual center. The tool allows for a theoretically correct depth of center before the countersink functions.



ENORMOUS CASH REGISTER AIDS WAR-STAMP DRIVE

To advertise and record the sale of war-savings stamps in Indianapolis and Marion County, Ind., a "cash register," three stories in height and 30 ft. in width, was erected. Characteristic features of such machines, including means for displaying the amounts of individual and gross sales, were painstakingly incorporated. The platform, analogous to the shelf above the drawer of the average register, was used by

A Cash Register, Three Stories High, on Which Sales of War Savings Stamps were Recorded: Patriotic Speeches were Delivered from the Railed Platform

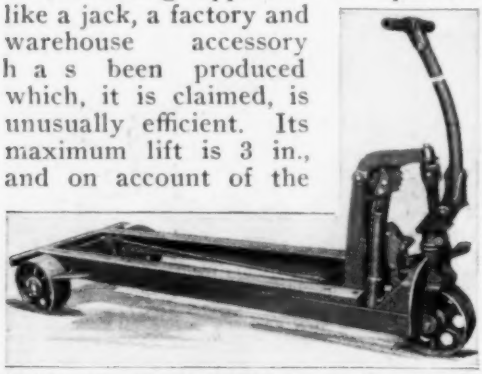
patriotic speakers who gave noontime talks to passers-by. The lower part of the structure was utilized as a sales place for stamps.

EQUIP STREET MARKERS WITH REFLECTORS

Following the placing of steel disks at Los Angeles street intersections to serve as traffic guides, it was found that these markers were the cause of frequent accidents because they could not be seen readily at night. To remedy the difficulty, three holes were drilled in each of the four sides of each disk, and into these recesses were set small bull's-eyes, backed by mirrors. The disks so improved are easily discernible at night and have occasioned no mishaps.

TRUCK WHICH ELEVATES LIKE A LIFTING JACK

By designing an elevating truck whose lifting apparatus is operated like a jack, a factory and warehouse accessory has been produced which, it is claimed, is unusually efficient. Its maximum lift is 3 in., and on account of the compound leverage employed, one man can handle a four-ton load with it. The trucks are supplied with 7 or 10-in. wheels, according to the model desired, the tires being made very broad. Crucible steel is used largely in the construction.



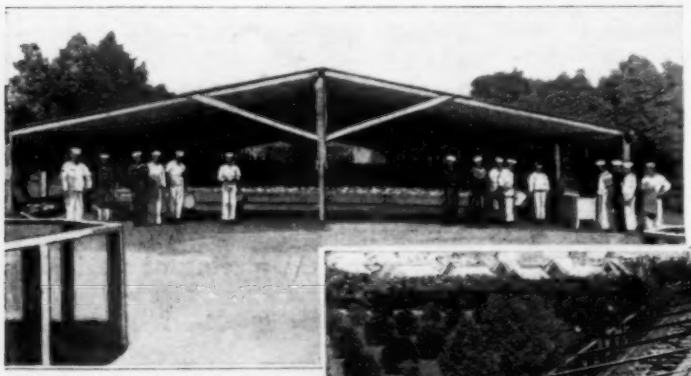
An Elevating Truck of 8,000 Pounds' Capacity, the Platform of Which is Raised and Lowered Like a Lifting Jack

MOTORS IN NORWAY BURN PEAT GAS

As a means of partly overcoming the serious condition created by the shortage of fuel, a concern in Norway has placed on the market a motor equipped to operate on peat gas instead of benzine or petroleum. The use of the fuel is made possible by an invention perfected in Denmark where, it is said, a large number of motors similarly driven, are in use. The claim is made that the new system consumes approximately 2 to 4 lb. of peat per horsepower-hour.

NAVAL MESS HALL BUILT IN STREET

At one of our naval training camps, a paved street has been converted into an open-air mess hall. A light frame overhead structure, strung with wires, supports canvas curtains. The roof thus formed shields the tables below from the direct rays of the sun and gives protection on rainy days. The free use of water keeps the wooden tables and the pavement scrupulously clean. The roof curtains are drawn back and the sun allowed to dry the place thoroughly after the daily washing. This aids materially in keeping the mess hall in a sanitary condition.



Front View of the Mess Hall, Showing the Roof Curtains in Place and the Tables Set in Readiness for Hungry Jackies

Here the Street Pavement has been Given a Thorough Washing and the Roof Curtains of the Mess Hall Drawn Back to Permit the Sun's Rays to Evaporate the Water and Freshen Things

Showing the Design and Use of the New Cabinet Door for Hotels: Left, Guest Removing Apparel from Compartment; Center, Interior Arrangement of Door, and Right, Corridor View

CABINET DOOR SAFEGUARDS PRIVACY OF HOTEL GUEST

Guest rooms in some of the newest city hotels where a high standard of service is maintained are supplied with cabinet doors. These are so designed as to serve as depositories for articles delivered to, or taken from, a room by servants. In addition to being of general convenience, they have the even greater merit of safeguarding privacy and obviating an annoyance well known to all travelers. The door is built with double panels that are bulged so that a space several inches in depth is afforded between them. Two shelves are provided at the bottom, and rings are attached at the top. Garments, for instance, that are being sent to the tailor, or dispatched by him to a guest, may be hung in the upper part of the cabinet without being crushed. The panels are hinged and fitted with locks. Only one of them can be opened at a time. The arrangement enables a guest to transact all business by telephone without having at any time to answer knocks at the door. Ventilating spaces at the top and bottom of the door are controlled by push buttons installed above the knob. This eliminates the transom and shuts off the light and most of the noise from the corridors.

DRINKING FOUNT SUPPLIES HOT AND COLD WATER

A sanitary drinking fountain from which gushes both hot and cold water is the decidedly novel feature to be found on a street in Ouray, a mining town in western Colorado. The fountain consists of an ornamental cast-iron post from which extend two curved arms, each supporting a basin, in the center of which is an overflowing cup. From the one flows cold water piped from snow-fed mountain streams, while from the other runs hot water drawn from near-by hot springs, of which there are many in the vicinity.

¶According to a recent ruling the regular or parcel-post mail cannot be used to carry United States coin or currency, or gold coins of United States or foreign mintage, or gold bullion, to countries outside the United States and its possessions.

NOVEL UNIFORMED DUMMY AIDS RECRUITING

Army recruiting was considerably stimulated in a western city by displaying on the street a dummy clad in a soldier's uniform. The figure was complete except that in place of a face was a mirror in which the prospective soldier could see his own face and so judge how he would look in khaki. On the breast of the figure was a placard which read, "Step Up and See Yourself in a Man's Clothes."

Khaki-Clad Dummy with a Mirror for a Face and a Well Worded Placard, Effectively Employed in a Recruiting Campaign

EMPLOYMENT MANAGEMENT NEW FIELD FOR WOMEN

The flocking of tens of thousands of American women to factories to engage in war work has made acute the demand for women employment managers—women who have an understanding of factory work from the point of view of practical business, as well as from the workers' standpoint. That concerns may be provided with such trained helpers the War Industries Board is offering a preliminary course for women having no factory experience, in Cleveland. This is to be followed by a six-weeks' intensive course in employment management at the University of Rochester. Later intensive training will be given in New York, Boston, and Pittsburgh. The women taking preliminary training are required to put on aprons or overalls and work shoulder to shoulder with other operatives. As managers they will be expected to help in many ways.

ADORN HIGHWAY AND HONOR LINCOLN WITH FOUNTAIN

A substantial fountain has been erected on the Lincoln Highway in a middle-western town, the design of which is rather different from the conventional type. Rising from the center of a many-sided masonry inclosure forming the basin, is a short column from which flow four streams of water, while above this, supported by a single standard, are metal tablets containing a portrait of Lincoln in bas-relief and appropriate quotations from him.

A Fountain of Rather Unusual Design Erected by a Patriotic Organization on the Lincoln Highway

An Improvement That Promotes Both the Safety and the Beauty of the Highway: These Guards of Concrete and Wood at Either End of a Culvert Lessen the Danger of Accident on This Concrete Road

CULVERT WITH GUARDS MAKES ROAD SAFER

Because unguarded culverts on country highways are frequently the cause of serious automobile accidents, particularly at night, special pains is now being taken in many parts of the country to place railings at the ends of such structures, together with suitable guards either side of the approaches. An excellent example of such an improvement is found in the substantial concrete guards on a highway in Michigan. The short lengths of fence are of wood and are painted white to match the concrete and to add to their conspicuousness, particularly at night.

SWEDES MINE MUCH COAL IN ARCTIC ISLAND

A Swedish concern is now engaged in mining coal in the great artic island of Spitzbergen, where it has large concessions. It is estimated that this year 30,000 tons of the fuel, which is a fine bituminous coal, will be mined. The great difficulty to be reckoned with is that the island is icebound for all but nine weeks in the year. The shore is flat and the tide is considerable. From one of the seams where some work has already been done, the coal is discharged down chutes to a storage place near the shore. At this point a crane loads the fuel onto cars which run on a track and discharge onto an endless carrier belt. This belt travels out over the water and empties its burden into the hold of the receiving ship.

CHINESE WASH WINDOWS IN RIVER

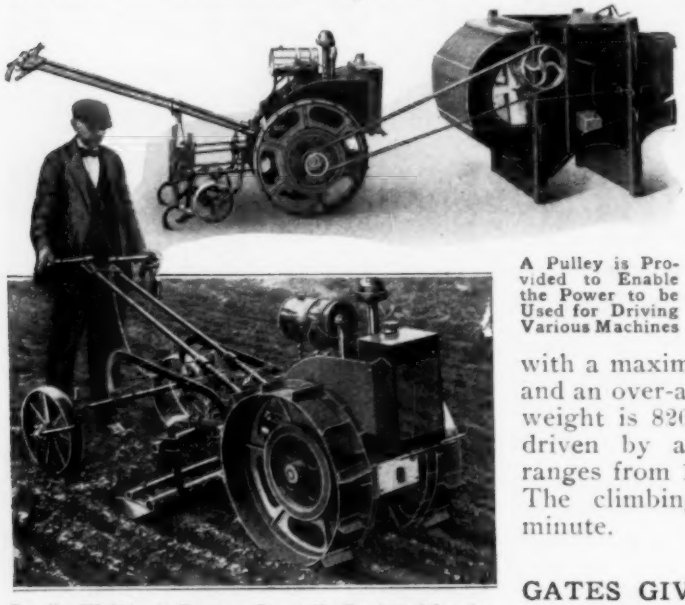
Window washing is, in many cases, an easy task in China, particularly if there is a clear stream near by. Instead of climbing up and down step-ladders and sitting precariously on window sills to perform the task, the Chinese house cleaner lifts the window

Window Washing amid Picturesque Surroundings in China: The Sashes Are of a Type That can be Easily Removed for Thorough Cleaning

sashes from their place and carries them to the river for cleansing, as shown herewith. This enables him to thoroughly wash all parts of the woodwork as well as the glass.

SMALL TRACTOR IS BUILT FOR TRUCK GARDENER

Practically all conventional farm tractors are considered impracticable



A Pulley is Provided to Enable the Power to be Used for Driving Various Machines

Small "Walking" Tractor Specially Designed for the Use of Truck Gardeners Whose Wants are Not Served by the Average Machine

for use in small truck gardens, but a machine designed particularly for this purpose has of late been brought out which seems to have strong points in its favor. Structurally it reminds one of certain motor-driven mowing machines; that is, it is a two-wheeled contrivance with control bars extending rearward and giving it an appearance not greatly unlike some such devices. Implements are coupled to it at the rear in the customary manner and controlled readily by the operator who follows the machine on foot.

¶French scientists assert that if a luminous watch is moved slowly before one in a ruby-lighted dark room, the luminous figures appear to move slower than the timepiece, as if flexibly attached. The explanation offered is that the persistence of luminous impressions on the retina varies with the wave length of the rays producing them.

AMERICAN FIGHTING PLANE MAKES GOOD SHOWING

Rigid tests to which a Berckmans single-seater aeroplane was recently subjected demonstrated convincingly that a real speed scout has been developed in America for war service. This trim little machine, capable of two and a half hours of continuous flight, was piloted to an elevation of 22,000 ft. and brought back to the field in 27 minutes. The scout is a biplane with a maximum wing spread of 26 ft. and an over-all length of 18 ft. Its net weight is 820 lb. and its speed, when driven by a 100-hp. Gnome motor, ranges from 115 to 154 miles an hour. The climbing speed is 1,100 ft. a minute.

GATES GIVE WAY TO CATTLE GUARDS IN MOTOR ROADS

For the benefit of motor tourists and stockmen alike, gates are being replaced by guards in roads traversing the cattle country in California. The change is convenient for the automobilist, for it obviates the frequent necessity of stopping to open and close barriers. Similarly, it safeguards the ranchman against the danger of careless motorists failing to lock gates securely. The guards are like those used on railway lines except that planks instead of rails cross them.

At the Direction of the California Highway Commission, Cattle Guards Like This One are being Substituted for Gates in Stock Districts

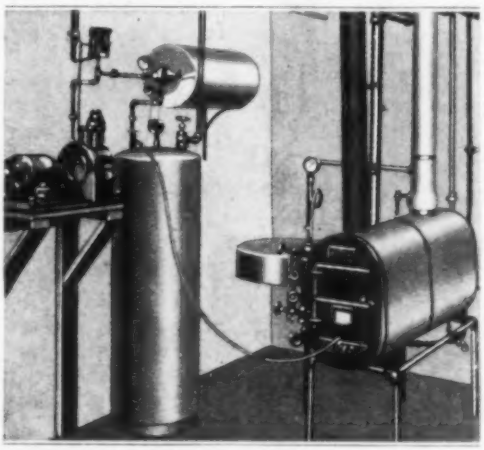
A Dusky Sextette of Women Laborers with Shovels and Wheelbarrows Posing for the Camera Man in the Yards of a Southern Gas Plant

HEAVY WORK DONE BY NEGRO WOMEN LABORERS IN SOUTH

Heavy manual labor formerly done by men is now being shouldered by Negro women in the employ of a gas company in a southern city. Garbed in common shirts and overalls, the women, most of whom are large and used to rough, hard work, stack bricks, shovel coke, wheel ashes and cinders, load wagons, and take care of various other jobs of similar character. They are said to do their work efficiently.

OIL-HEATING SYSTEM BUILT FOR STEAM RADIATION

In view of the prevailing coal situation, the introduction of an oil-burning equipment for steam and hot-water heating plants has timely interest for householders in many sections of the country. The outfit consists of a special boiler, fuel and air-compression tanks, an atomizer, a pneumatic pump, and a motor. Either kerosene or distillate may be used as fuel. The cold spray emanating from the nozzlelike atomizer produces, when ignited, a flame that is spread by a baffle plate to every part of the cylindrical boiler, which contains only a small amount of water. Only a little space is required for installation. The equipment is



The Plant Is Continuous in Operation and Demands but Little Attention. The Boiler Has Thin Double Walls between Which a Very Small Amount of Water is Held. Heat is Absorbed and Steam Generated Quickly

white-enameled and therefore easily kept in clean condition.

¶The municipal authorities of Lyon, France, have recently named a new bridge crossing the Rhone the "Wilson Bridge." The structure parallels one which has borne the name of Lafayette for a century.

STRONG STEEL-TRUSS POLES MADE OF SOLID BEAMS

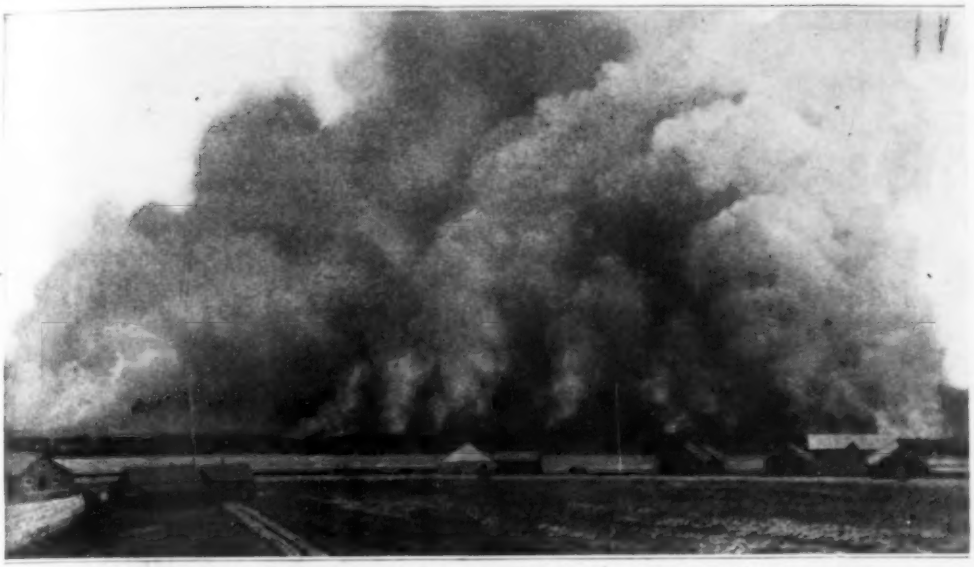
One-piece steel-truss poles of sightly appearance and great strength are coming into use for high-tension lines, street-lighting systems, and similar purposes. Apparently they possess several distinct advantages, but in addition to these they are interesting because of their character and the manner in which they are made. The casual observer might mistake them for fabricated members. Instead, however, of being built up of many parts, they are constructed of specially rolled H-sections of open-hearth steel. The work is done by shearing the web of such a beam at measured intervals along two parallel lines. This is effected by an enormous rotary shear, after which the member is transferred to a furnace and heated to a temperature of 1,400°. It is then expanded by a hydraulic machine that grips the opposite flanges and draws the section to the desired size. The web thus becomes a zigzag series of triangles, and the whole member a one-piece truss. It is claimed that the expanded pole has four and a half times the strength of the original beam. Structural members are also made in similar manner. A hypothetical proposition is interesting: Steel members aggregating four tons of strength are desired. A ton of I-beams can at a cost of a few dollars be trussed by the expansion process so as to give four-ton strength, it is claimed. This conserves three tons of steel and saves three-fourths of the freight cost.

The Pole at the Left Is Not a Fabricated-Steel Member, but Consists of One Piece of Material That has been Sheared and Expanded

At the Right a Rotary Shear is Making a Double Line of Spaced Incisions in an H-Section Which, in the Middle Picture, a Powerful Hydraulic Machine is Shown Expanding. This Process Produces a Comparatively Light Unit of Great Strength

TRAINED FORESTERS OVERSEE ALL CLEARING FIRES

Comprehensive steps have been taken in Canada to prevent disastrous forest fires. According to regulations now in effect, settlers are no longer allowed to use fire in clearing their property, except under the personal supervision of experienced forest rangers. In the past, many costly conflagrations resulted because proper precautions were not taken when burning underbrush and logged-off lands adjacent to woods. In dry seasons, and at times of high winds, burning



Under the Supervision of Government Rangers, Clearing Fires, Such as This One, are Kept within Proper Confines and Prevented from Destroying Forests

is prohibited. As supervised by rangers, the work is executed with intelligent care so that a fire, after being started, is kept within control. Ground adjacent to standing timber is cleared and the rubbish piled in windrows well back from the trees.

BUILD BARGES TO RELIEVE CONGESTION AT PIERS

Work has begun on a large number of barges of about 900 tons' carrying capacity, which the government will employ in loading vessels, instead of making it necessary for all ships to utilize the piers now so congested. One order is for 30 of these lighters, 132 ft. long, each of which is to be equipped with a derrick that can lift three to five tons. As many as six of these craft can load a vessel at once, after they have assembled material and supplies from widely scattered warehouses and stores.

¶The Bureau of Standards recently tested various preparations called gasoline intensifiers now on the market but, though the machinery used was very sensitive, no increase in power could be detected.

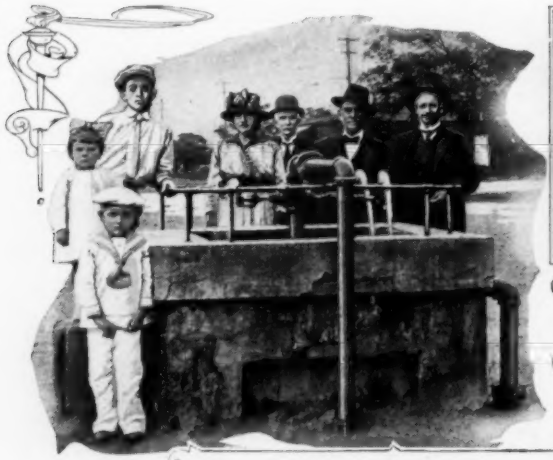
POPLAR LUMBER DRIES BEST WHEN STACKED ON END

It has been found that yellow poplar fresh from the saw may be dried quickly and without staining, if piled on end. By such an arrangement moisture drains freely and ventilation is improved. A few hours after the lumber has been stacked, it looks as if buckets of water had been thrown about the bottom of the pile. One-inch stock dries bright and rich in color and

Fresh Yellow Poplar Stacked on End to Facilitate Drying, a Method That Largely Eliminates Staining

is ready for shipping within a few weeks. While satisfactory for certain other soft woods, the plan is not recommended for oak and similar material because of their tendency to warp.

CIVIC FEATURES THAT PROMOTE THE COMFORT



A Splendid Artesian Well in Oglethorpe, Georgia, at Which Scores of Motorists Stop Daily, as It Is at the Intersection of a Prominent Local Thoroughfare and the Dixie Highway

Many Vacant Lots in Los Angeles have been Beautified by Planting Them with Wild Flowers, While Signs Like This, Erected by a Public-Spirited Club, Help to Conserve the Blossoms

With One Accord the Whole Population of Jacksonville, Florida, Including Speeding Motorists, Store Clerks, and Pedestrians, Stop a Full Minute and Come to Attention When a Whistle Announces That the Flag is being Lowered, as Shown Here. A City Ordinance Makes the Observance Compulsory

When the Recent Liberty Loan Drive was on in Jacksonville, Florida, No One Who Ventured down the Street could Ignore the Campaign, for Steps Like These Barred the Way at Frequent Intervals, and No One Cared to Class Himself as a Slacker by Walking around Them

AND ENJOYMENT OF RESIDENTS AND VISITORS

A Watering Trough of Bronze and an Ornamental Seat Combined in Such a Way That Little of the Thoroughfare's Area, at a Busy Street Intersection in San Francisco, is Occupied: The High Back of the Seat, Which Is of Concrete, Entirely Shuts Off the View of the Trough for Those Who Pause to Rest Here

A Stereopticon Throws Information Regarding Trains on This Conspicuous Screen, Recently Erected for the Convenience of the Public in the Union Station at Washington

This Is One of Several Shallow Fords with Smooth Concrete Beds in Rock Creek Park, at the National Capital, Which have been Provided in Preference to Bridges Because They Are More in Accord with the Wild Beauty of the Tract

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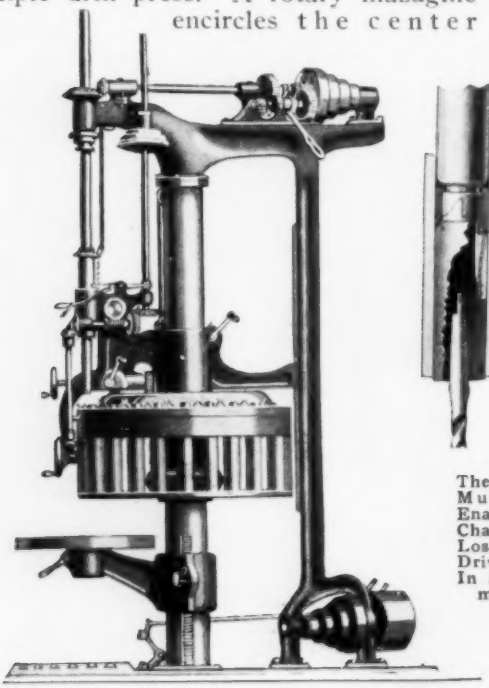
NEW MULTIPLE DRILL PRESS HAS LARGE TOOL MAGAZINE

Operating efficiency of high degree is claimed for a new automatic multiple drill press. A rotary mazagine encircles the center column of the machine, carrying about its outer circumference a large number of sleeves. These contain chucks supplied with tools of various sizes held in suspended position. By turning the cylinder the desired instrument is quickly brought into alinement with the driving spindle so that the clutch members of the two engage automatically.



The Arrangement of This Multiple Drill Press Enables a Workman to Change Tools without Loss of Time. Above, the Driving Spindle is Shown In and Out of Engagement with a Holder

GAS-PROOF CONTAINERS FOR SOLDIERS' FOOD

A problem confronting the Quartermaster Corps, as a result of the use of gas on the fighting front, is to protect the soldiers' food from these poisonous fumes. This applies to all food brought up to the trenches. Hermetically sealed tins are, of course, satisfactory, but owing to the limited supply of tin, packages that are paraffin-sealed are being considered also.

MUSSELS ARE CANNED BY NEW PROCESS

A fish-canning company has devised a process for preparing and packing mussels so that they can be shipped long distances. Because these shellfish are found in large quantities in salt waters of the temperate zone the new process promises to make an important source of food available for inland regions. The mussels are removed from their shells, and the organic matter which has been taken into the body is separated from the meaty portion of the fish, which is then shredded, thoroughly cooked, and packed in tins. It is said that these canned mollusks have a flavor more delicate than clams or oysters. They are especially recommended for chowder, as a base for soups, and for meat dressings.

GOLD-SAVING WORKING CASE FOR DENTAL PRACTITIONER

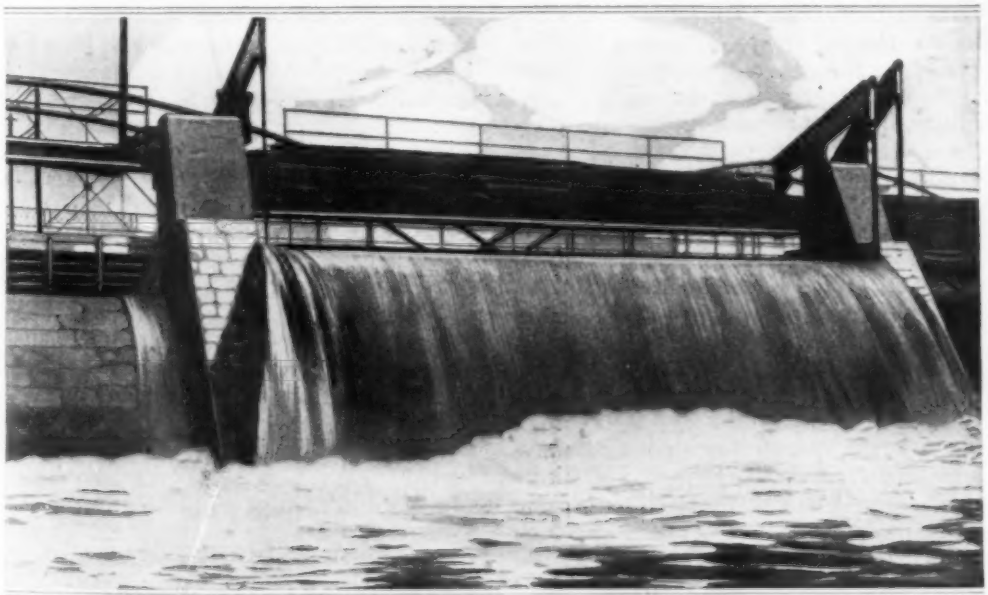
By employing an inclosed working case, designed specifically for the purpose, a dentist may save all of the excess gold solder he grinds from inlays, crowns, and bridges. The device consists of a square metal box, of small size and light weight, that has a glass front and top and is supplied at opposite sides with oval openings for the insertion of the hands. When in use the case is hooked to the operator's coat in a convenient position.

Downstream View of the Automatic Gates in the Dam at Nashua, Iowa, in a Closed Position: They are Operated by Water Pressure—a Great Force That Never Fails—and Measure 46 by 7 Feet

AUTOMATIC GATES BIG FACTOR IN SAFETY OF SPILLWAY DAMS

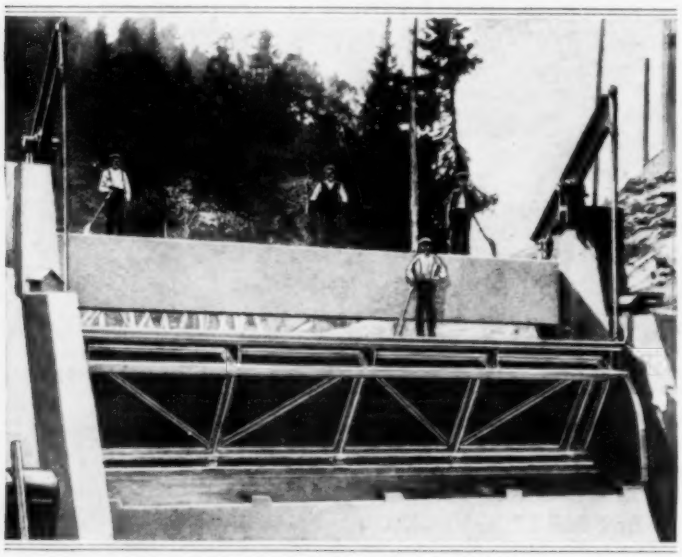
By ROBERT H. MOULTON

THE frequency with which dams in various parts of the country have failed during the last few years, resulting in heavy casualties and enormous damage to property, has led to the introduction of a type of automatic spillway gates which seems destined to eliminate this source of danger, if generally adopted. Ordinary spillway gates operated by machinery are sub-



One of the Nashua Dam Gates in an Open Position: Not being Dependent for Its Operation on Complex Machinery or Constant Attention of an Attendant, This Type of Gate is Considered Much Safer Than Those of Older Design

ject to failure, either through a deficiency in the power supply or lack of attendance at the critical moment. Particularly is this true of such gates on large streams where great amounts of débris or heavy masses of ice must be spilled, and where the gates have parts, susceptible to injury, projecting above the spillway. The automatic gates, on the other hand, possess none of these defects, since not only are no vulnerable parts exposed, but the gates are operated by the water pressure itself, a great force which is always present and which never fails. A number of these gates have been installed in this country, notably at the great Wissota Dam in Wisconsin and at Nashua, Iowa.

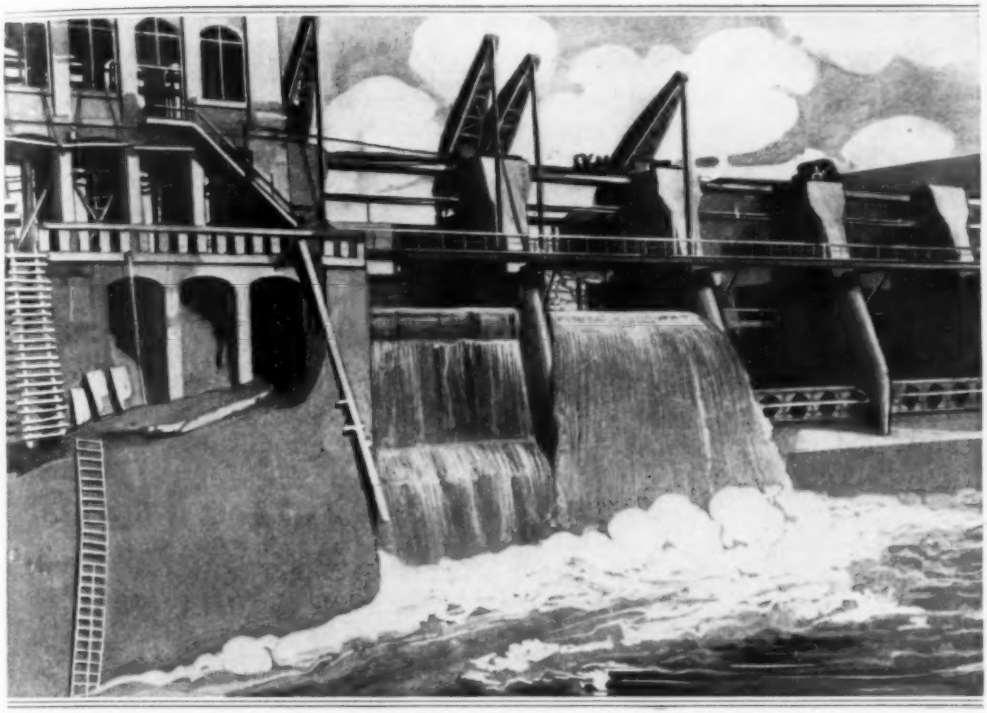


An Automatic Spillway Gate in Norway within the Arctic Circle: Engineers Maintain That This Style of Gate Operates Satisfactorily in Spite of Ice and Cold

Prominent engineers claim that the operation of properly designed movable dams of the hinged-leaf type in cold climates is more satisfactory than any other form of unsubmerged movable dam crest now known. The hinge itself is well below the surface of the upper pool, or head water, and can readily be protected from cold on the downstream side. This protection may consist of a freely suspended flap of steel, or wood, so arranged as to avoid freezing to the downstream face of the dam. Where the temperature remains for some days below zero, means for heating the chamber underneath the moving leaf may easily be provided.

It is readily seen that any gate of the hinged-leaf type will open easily, as the pressure of the water always tends to move the gate to the open position. Even when frozen in somewhat, the tremendous water load on the gate always seems to be sufficient to shear off the ice along the ends of the gate. Two hinged-type gates, both in the state of Michigan, have been operated over 11 years under conditions of weather such as to test their practicability to the utmost, and have proven eminently satisfactory in every respect. Of these two hinged-leaf gates, one is on a 40-ft. dam at Croton, Mich., the steel movable crest being 40 ft. long and 3½ ft. high and operated directly by a motor-driven hoist without counterweights. This gate is used throughout the year for pond regulation, and no trouble whatever has been experienced with it, notwithstanding the cold weather which prevails in that part of Michigan during the winter. A somewhat similar gate is at Webber Dam, Mich. This is 60 ft. long by 5 ft. high, and is counterweighted and operated by electric motors.

The hinges of these two gates seldom, if ever, freeze in so that they cannot be operated, and no heating appliances are installed. As soon as a few inches of water flows over the slightly lowered gate, the action of the warmer water, coming from under the ice blanket of the pond, thaws whatever ice there may be along the sides of the gate and below it, so that after the lapse of a fraction of an hour



The Dam at Tremp, Spain, Equipped with Automatic Spillway Gates Measuring 32 by 19 Feet: In Barriers of This General Design a Remarkable Degree of Sensitiveness Is Attainable, an Inch Rise in the Water in Some Cases Being Sufficient to Start the Gate

the gate can be fully opened. This type of construction is a part of the automatic gates in use today, as they are hinged at the bottom and balanced against the water pressure by a counterweight. This counterweight is suspended from one end of a balance beam, the other end of which is fastened to the gate near the top. The balance beam can be arranged overhead or under the gate. The proportion of lever arm of the water-pressure and the counterweight moments can be designed in such a way that the gate is balanced in all positions. This equalization of moments for different heights against the gate is accomplished in certain designs of gates by arranging the trunnion of the balance beams to roll along a straight or specially curved path, thereby constantly changing the proportion between the lever arms. If the trunnion did not roll, the balance could not thus be maintained at different heights of water. The gate, therefore, opens when the water elevation rises above normal, but remains open only until the discharge is equal to the flood, the water level thus remaining stationary. As soon as the flood recedes, the water level drops and the gates automatically close.

The degree of sensitiveness which has been attained is remarkable. An inch rise in the water level is sufficient to start the gate. The balance beams are supported on rollers, and the lower hinges of the gate are constructed as knife-edge bearings—a somewhat novel construction—in order to diminish the frictional resistance.

The automatic gates may be equipped to permit compulsory service, when the gates may be moved by hand or machinery, either for the purpose of letting the water out of the pond or to wash out the sill; and can also be constructed for the maintenance of different water levels. This construction consists of a simple Archimedean screw and wheel work, and can be operated by hand as well as electrically.

BOOTBLACK IN HOTEL WORKS FROM FLOOR TO FLOOR

In one of the large, new mid-western hotels the house bootblack is supplied with a shoe-shining stand mounted on casters so that it may easily be pushed into a freight elevator and transferred from one floor to another. After collecting shoes on one floor, polishing them, and returning them to their owners' rooms, the attendant moves the equipment to another story and repeats the routine. In this way time and labor are saved and confusion is obviated.

Conveniently Arranged Compartments Hold the Various Polishes, Cleaning Preparations, Brushes, and Cloths Where They Are Readily Available as Needed

PROTECT COARSE FLOURS AGAINST INSECTS

As many housewives know, coarse flours are particularly subject to the attack of insects in the summer and for that reason, unless special precautions are taken, a large amount of the substitutes for wheat flour now being used will be damaged. While millers endeavor to overcome the difficulty by quick shipments, and consumers are advised to buy only in small quantities and to avoid sealed-package products with broken containers, additional measures also must be employed.

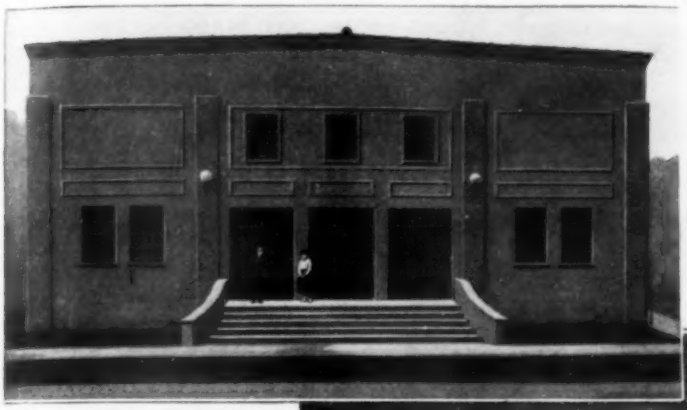
A simple, effective preventive recommended by the Minnesota Food Administration is that every consumer heat the coarse flours in the oven soon after purchase, pans about two inches deep being used for the purpose. The temperature should be raised until the surface of the cereal reaches about 185° F., after which the fire is turned out, the flour stirred, and allowed to remain in the closed oven for 45 minutes. Since oven thermometers are not common, a wax has been prepared which it is proposed to place on the market. This melts at the temperature stated above and when placed in an oven with flour enables the housewife to regulate the heat properly.

VENDING DEVICE DISPENSES THRIFT STAMPS

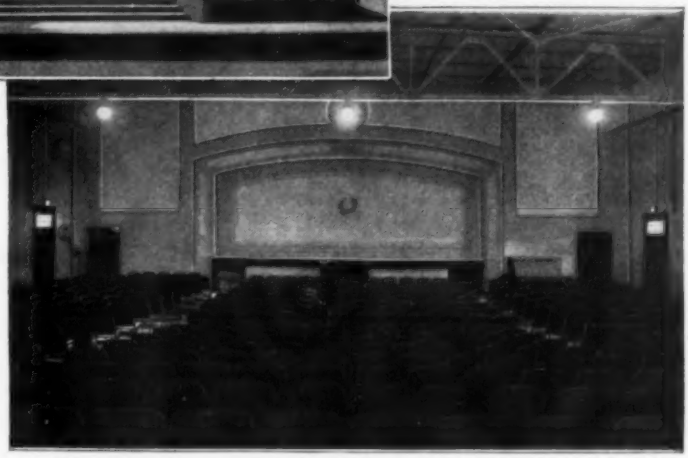
To promote and facilitate the sale of government thrift stamps in business institutions, factories, and public places, a special vending machine has been developed. It accommodates rolls of 100 stamps and dispenses them singly as quarters are dropped in a slot and a crank revolved. A magnet is used to attract and divert into a special channel counterfeit coins that may be introduced. In a large establishment where many persons make stamp purchases regularly, the transactions obviously consume a considerable part of some clerk's time. Therefore, from an economical standpoint, the machine, which is rented at a nominal monthly fee, seems to have a legitimate purpose. Furthermore, its installation in certain places might reasonably be expected to increase stamp sales.

MANUFACTURING PLANT HAS COMMUNITY THEATER

A modern theater has been added to the equipment of a manufacturing plant in a small industrial town as an expression of the concern's interest in its employes' recreation. Here the workmen and others in the community gather for amusement or discussion. Only a wall separates the playhouse from the factory itself. The structure seats 700 persons, is modern in every respect, and is equipped for theatricals, dances, and motion pictures. The stage is 30 ft. wide under the arch, and is fully supplied with scenery and electrical lights, with which varied lighting effects can be produced when the occasion may require.



Exterior of a Theater Erected in Connection with Its Factory by a Manufacturing Concern for the Recreation of Its Employes



The Interior Is Plain but Pleasing. It Seats 700 Persons and is Fully Equipped for Theatricals, Dances, and Moving Pictures. Only a Wall Separates the Playhouse from the Factory

NEW CAR HAS COMPARTMENT BACK OF FRONT SEAT

A convenient storage compartment back of the front seat, in which lunch or luggage can be carried, is an attractive feature of a new model of a touring car. The partition forming the back of the front seat bulges slightly toward the rear giving the compartment additional space. A wide door hinged to the floor, gives access to the storage space and can be opened by occupants of either the front or rear seat. Pockets for holding so called vacuum bottles are provided on the inner side of this door.

This Convenient Storage Compartment Back of the Front Seat will Appeal to Every Motorist as a Handy Place Where Lunch or Luggage may be Kept

DOORS SWING AND SLIDE UP AND DOWN ALSO

A new type of front door, which is especially serviceable for stores and shops, has been designed to meet equally well the merchant's needs in

Door That Operates Like a Window: Left, the Sliding Door Lowered for the Night. In Cool Weather the Panels are Not Raised, but are Allowed to Swing on Their Hinges. Right, during the Summer the Entrance is Left Open Like This All Day

the warm and in the cold seasons. It is composed of two panels that swing on hinges in the usual manner and also slide up and down as a unit, like a window. During the summer no protection against the weather is needed and the doors are raised up, counterweights holding them elevated, while in winter they are operated like ordinary doors.

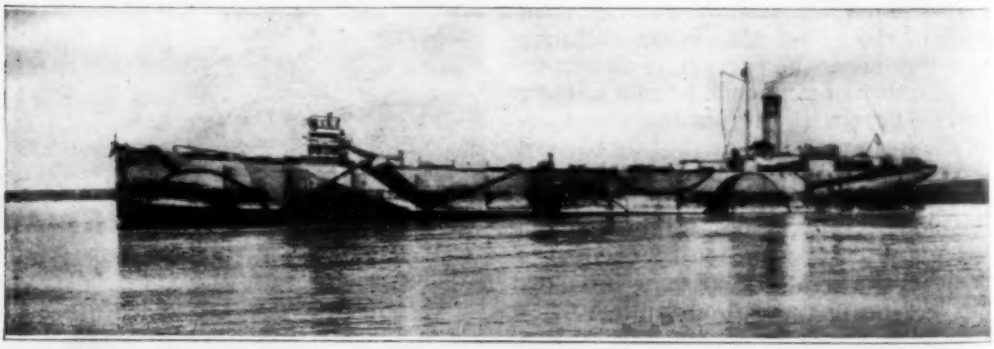
¶ Five women cow testers have been appointed dairy agents by the Department of Agriculture, one to work in Iowa and four in Wisconsin.

PURE WATER FOR SOLDIERS FROM PORTABLE PLANTS

An important factor in the low disease rate among our soldiers at the front is the pure water supplied from portable waterworks, mounted on motor trucks. These trains are equipped to do everything that a municipal water plant does. When a train arrives at a stream, a hose is placed in it and the water is pumped through a pressure tank, being chemically treated before it passes through a sand filter. Liquid chlorine is used in killing the germs, while other chemicals are employed in removing the excess of chlorine. On one of the trucks is a complete laboratory in which water is tested every two hours, or oftener if thought wise. The purified water is carried in trucks to the soldiers. Many of the men in charge formerly were municipal waterworks employes.

CAMOUFLAGED SHIP RECALLS LUMBER YARD IN CYCLONE

All ships that are camouflaged at all are "peculiarly camouflaged," but few if any of them present at short range a stranger appearance than this large tanker which recently put in at a North American port. Its sides not only present an orgy of color, but also curves and cubist angles that are extremely fantastic, if not actually weird. At moderate distances the ship looks not unlike a half-submerged wreck; at greater ranges it is practically indiscernible.



In Its War Paint This Tanker Presents So Strange an Appearance That a Camera cannot Adequately Portray It

USE BRUSH TO MAKE CANAL BANKS INDESTRUCTIBLE

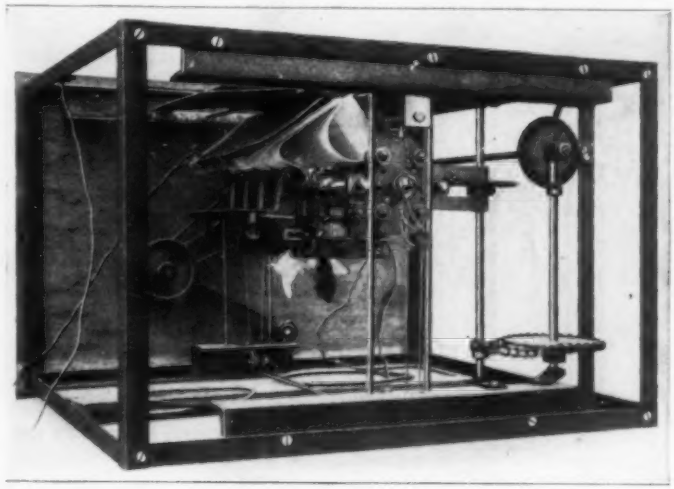
An example of the primitive methods which often must be resorted to when the forces of nature are to be combated on a large scale is the use of brush as riprap on the banks of the $5,000,000 Gunnison Canal in western Colorado. More practical for checking erosion than stone or concrete are the branches cut in large numbers from near-by cedars and piñons, and laid along the banks with the butts pointing upstream. Wire netting, or plain wire, fastened to stakes, is used to anchor the brush. In some cases, however, the erosion is so pronounced that the stakes do not hold and concrete weights are used. After a few months, sediment collects in the riprap, making it practically waterproof and indestructible.

DURABLE BARN-DOOR LATCH EXPOSES NO SCREW

For barn and garage doors, a wrought-steel latch with no screw exposed on the outside has been introduced. The catch is mounted on a plate and operated from either side by means of handles. Double keepers engage the member and hold the door firmly. The barrier is made secure by hooking a strong padlock through holes in the keepers. The inside handle is arranged to swing automatically into a depressed plate when released, so that the chance of accidental breakage is obviated.

BOOK-DISINFECTING DEVICE PERFORMS WELL IN TESTS

Thorough fumigation of library books is made easier by a machine that has been constructed especially for that purpose. A volume is held in an inverted, half-open position within a glass case while its leaves are separated mechanically and subjected to strong disinfecting fumes. Feathers arranged about a revolving shaft move the leaves one by one without mutilating them. The apparatus is controlled electrically and has functioned well in tests.



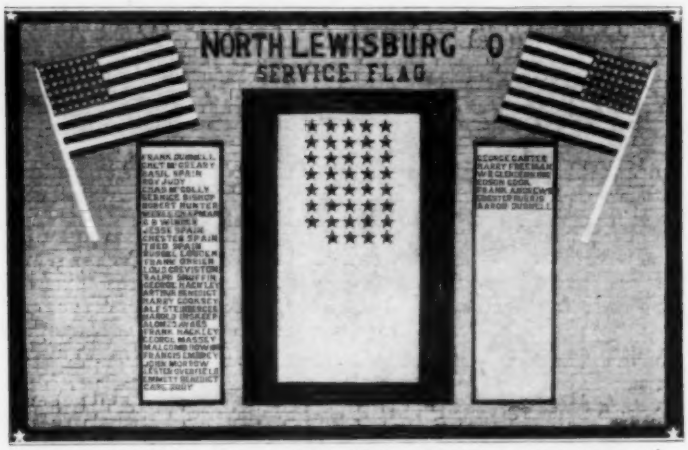
Feathers Arranged about a Revolving Shaft Flip the Pages One by One without Injuring Them. Thus the Fumes Reach Every Part of the Book

OZONE AS A FROST SHIELD FOR ORCHARDS

It is a fact familiar to scientists that the relatively large quantities of ozone to be found in the upper atmosphere do much toward regulating the earth's temperature by absorbing radiating heat. The interesting suggestion has been made that, if means could be found to charge the lower air above orchards, for example, with ozone, its capacity to absorb radiating heat might be sufficient to prevent frosts which otherwise would be destructive to the fruit, so much of which is now imperiled a few nights each season.

COMMUNITY SERVICE BANNER AND HONOR ROLL

One side of a brick store building at New Lewisburg, Ohio, has been

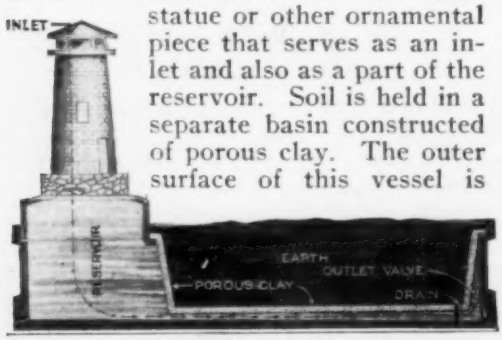


The Panels Bear the Names of Local Boys for Whom Stars have been Placed in the Community Service Flag

dedicated to the loyalty of those of the village's sons who are under arms. On either side of a painted service flag, which appears between two pictures of Old Glory, are narrow panels bearing the names of local boys who have responded to their country's call.

SELF-WATERING FLOWER BOX FOR HOME

Novelty is one of the chief attributes of a self-watering flower box recently invented. At one end there is a small statue or other ornamental piece that serves as an inlet and also as a part of the reservoir. Soil is held in a separate basin constructed of porous clay. The outer surface of this vessel is



Showing the Arrangement of the Self-Watering Flower Box, Its Reservoir, Outlet Valve, and Drain

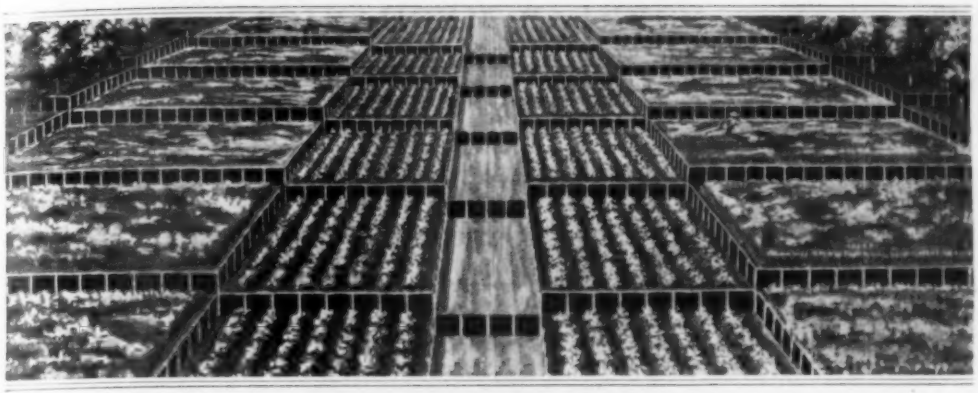
constantly in contact with the water. Capillary action is adequate to keep the dirt moist at all times.

TRAVELERS CAN NOW USE UNIVERSAL SCRIP

One of the latest innovations introduced by the railroad administration is the placing on sale of universal mileage scrip, sold at the basic rate of three cents per mile. It can be used for the payment of sleeping-car and dining-car charges and excess-baggage fees, as well as a substitute for regular tickets on all railroads under government control. The war tax will be collected by the conductor at the time the scrip is presented to him. The change is expected to prove a great convenience to travelers and to ticket agents as well.

HEAVING OF WOOD-BLOCK PAVING PREVENTED

The heaving of creosoted wood-block pavement caused by the swelling of the blocks has been overcome by laying them on a concrete base over which a coating of bituminous material, such as coal-tar pitch, has been spread. In preparing the concrete foundation, a true surface is obtained at low cost by using a light metal roller which compresses the concrete, extracts the excess of water, and produces a smooth finish. When this surface has set properly the coal-tar pitch is poured on and spread evenly over it. After it has hardened, the blocks are laid in the usual way and the joints filled with hot tar, the space left after the tar cools being filled with sand. This method of binding the blocks together has been found necessary to prevent the overflow of the tar onto the pavement in warm weather. In paving between street-car tracks, the surface is made concave to prevent the water seeping in beside the rails. Track drips are placed at suitable intervals.



In Valleys the Side Levels Fill and Become Fertile Areas Capable of Cultivation. They may Vary in Length and Width According to the Gradient of the Stream and the Side Slopes

A REVOLUTIONARY SYSTEM OF STORM-WATER CONTROL

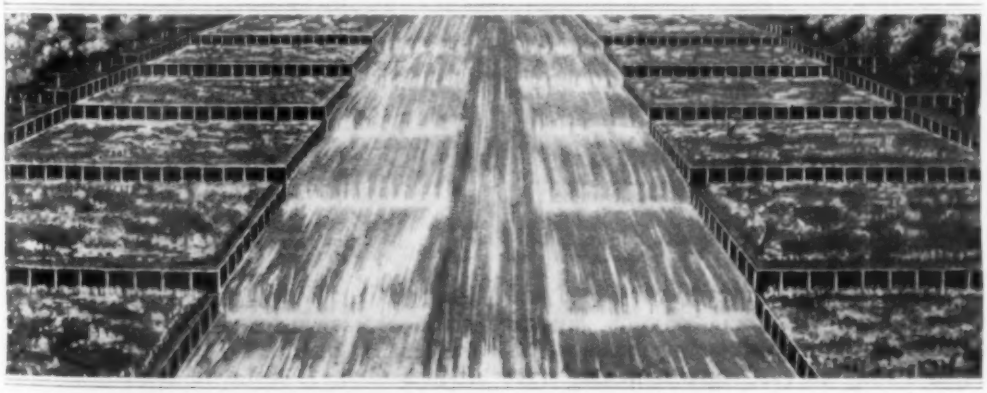
By ALBERT MARPLE

CAN a storm-water torrent be controlled by wire netting?

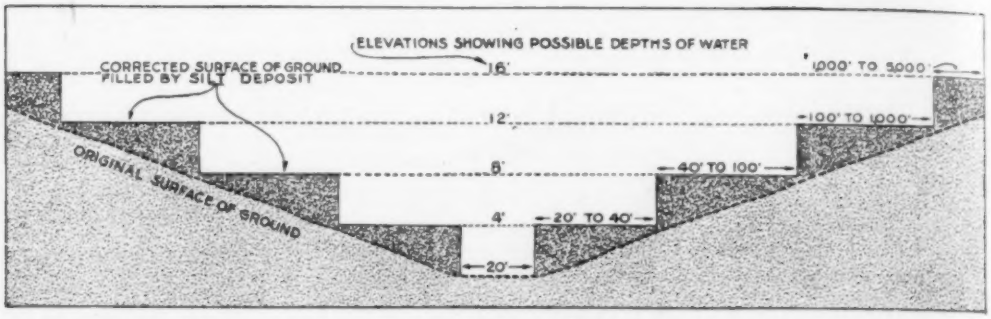
The average reader would say "no," but a western expert claims that by proper arrangement "pig wire" may be made to eliminate all the destructive tendencies from the biggest volume of storm water "afloat." This engineer has brought forward a system which in construction and operation is entirely different from anything along this line ever invented.

His method is revolutionary in that it uses porous construction in the form of check dams, side elevations, etc.,—something through which the water may run rather than something by which it will be held and impounded. The material employed in this system may be wire netting, concrete slabs, steel bars, wood strips, or the like, the only difference between any of these being that one will naturally last longer than another. The holes or openings in this porous construction may be run vertically or horizontally or at any angle between the two.

Thus far in this installation hog, or woven wire has been used almost exclusively, and has been found entirely satisfactory. The system may be applied all along the stream or simply at the most offending points. One of its principal points is that the elevation of the top of each dam must be approximately the same as the bottom of



When Installed on Comparatively Level Stretches, the Dams, before a Flood, Look Like Ordinary Fences. In This Drawing Storm Water Fills the Center Channel and Inundates the First Levels



Cross-Section Diagram Explaining How the Slopes are Gradually Built Up by the Deposit of Silt After the Porous Check-Dam System of Storm-Water Control has been Installed

the dam immediately above it. To accomplish this it is often necessary, as the work proceeds upstream, to elevate the structures higher and higher, depending upon the grade of the stream bed. If the bed is long and steep, the dams will often be suspended six, eight, or even ten feet in the air, while those at the lower end may have to be buried several feet into the bed of the wash. In the latter case the sand above the dam levels will naturally be washed downstream during the first flood.

This new system works on the theory that the water, when it comes down the river or wash, will carry with it bowlders, sand, and floating débris. As the latter strikes the porous dam it clogs, to a certain degree, the wire netting, this, of course, retarding the water to some extent. The water naturally backs up, and within a few minutes there is quite a "pond" behind the dam. As the water continues to carry débris downstream, the blocking becomes more complete, and before long the pond may be several feet deep. The nonfloating material, as it is being carried downstream, naturally comes to a stop when it strikes the comparatively still water and sinks to the bottom at the upper end of the "pond." This operation shows that the floating débris is checked by the dam itself, while the heavier material must fill practically all of the basin before it comes in contact with the dam, or, rather the floating material behind the dam. Each dam is anchored into the stream bed, so that when the basin is full the dam is practically immovable.

When the first basin is full the floating débris naturally catches upon the lower edge of the second dam—which is level with the top of the first dam—and the filling process takes place in the second basin, and so on upstream. The stream bed, after the filling process has taken place, resembles a series of steps, each one of which is anchored within itself and cannot be washed out.

Numerous Attempts, Involving an Expenditure of $75,000, have been Made to Control Storm Water in This Gulley, with the Result That All of the Labor and Money has been Wasted

Another important point is that, in cross section, the stream bed is lower in the center than it is at the sides, dams having been run parallel with the stream as well as at right angles to it. When the basins are filled with débris the bed will be "stepped up" from the center toward the sides as it is built in a series of rises from any given point upstream. The effect of this "side-step" construction naturally

is to induce the greatest velocity in the center of the system; the nearer to the side the waters come the less will be the depth and velocity. With the bed so "bound in," it is impossible for it to move; a fixed stream bed being the first requirement of successful flood control.

In addition to eliminating damage by flood water, this porous-check-dam system will, it is claimed, restore building lots and acreage that during past storms have been practically eradicated, the remarkable part about the matter being that this real estate is replaced by the very stream that carried it away. The wash bed in Laurel Cañon, just west of Hollywood, Calif., has been filled, in places, from 10 to 15 ft., in addition to all sections of the wash being protected. In valleys, the side levels of this system become fields intended for cultivation. These may vary in length and width, according to the gradient of the stream and the side slopes. When installed upon comparatively level stretches the dams, before the flood, appear as ordinary boundary fences, and do, temporarily, serve as such. When the flood waters arrive the fields build up to the height of the dams, the deposit being valuable silt worth $2 per cubic yard.

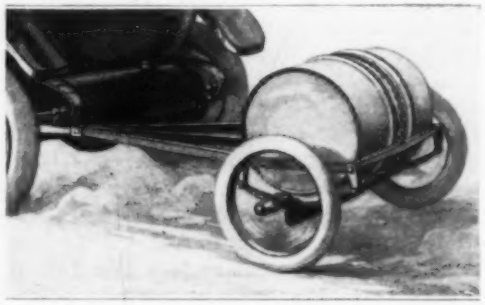
This system may be installed anywhere—in the cañons, along the banks of rivers, in wide valleys where storm-water protection is needed. It may also be used in connection with systems already installed along other lines, whereupon it will afford them, and the surrounding territory, protection. For instance, if built in connection with the levee, it could be run from the levee walls any distance to either side, so that if the levee, through a deposit of silt upon its floor, should become unable to hold the flow of water and it should flow over the levee top or otherwise break out, this water would be controlled by the side dams and, in this way, a great amount of damage averted.

Actual Installation of the Porous-Dam System, Showing Appearance after Storm When Water has Receded to Center Channel, Leaving Silt and Débris Forming a Series of Steps

The comparatively small expense of installing the new system is an attractive feature. When placed under like conditions its cost is from one-tenth to one-half of that of riprap, piling and wire, concrete, and other systems. To repair, should a break occur, the cost would be trivial.

TRAILER TRANSPORTS FUEL FOR TRACTOR IN FIELD

In addition to other uses to which it may be put, a new motor-vehicle trailer is adapted to carry a reserve supply of fuel for a tractor, on the road or in the field. Its frame forms a cradle for a standard 55-gal. barrel, which may be loaded or discharged

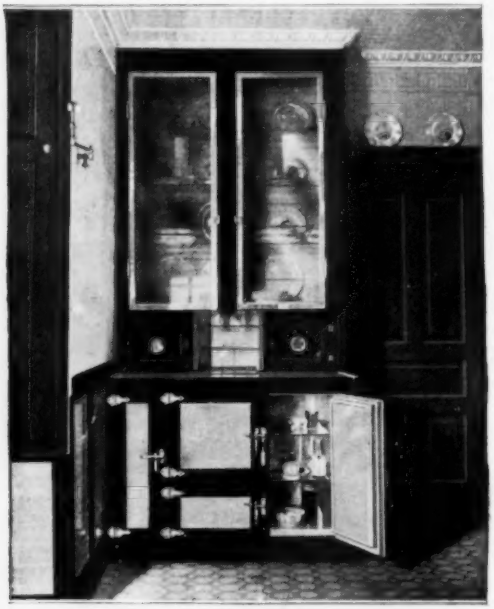


With a Box Fitted on the Frame, the Trailer may be Used for Carrying Other Things Than Fuel Barrels

in a few seconds by tipping the carrier rearward until it is in position to receive or release a container. Another feature of the contrivance is its offset drawbar, which provides for attachment to an inconspicuous coupling member, fixed a few inches at one side of the differential housing of a motor car.

COMBINATION REFRIGERATOR NEEDS NO ICE IN WINTER

Economical as well as convenient features are set forth as the advantages of a combination cupboard and refrig-



During Cold Weather Filtered Air is Fed to the Refrigerator from the Outdoors, Obviating the Need of Using Ice

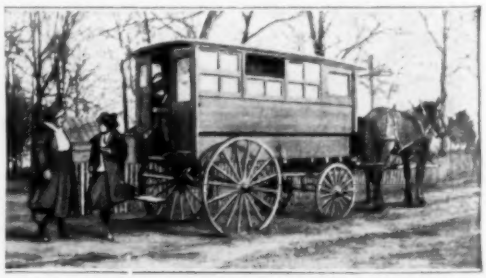
erator that has of late come to attention. Its arrangement saves time and steps for the cook, since food, china, and silverware are permitted to be assembled at one point, and that adjacent to the cabinet and range. The unusual part about it, however, is that the ice chamber is served by ducts which, in wintertime, supply cold, filtered, outdoor air for refrigerating purposes. This makes it possible for an indoor refrigerator to be used in northern climates several months of the year without ice.

MONTANA HAS BIG DEPOSIT OF ICELAND SPAR

Since the seventeenth century practically the only place in the world from which an adequate supply of perfect calcite could be obtained for use in making scientific instruments has been a small deposit in Iceland. In recent years, however, the supply of this remarkable crystalline substance, commonly known as Iceland spar, has been diminishing. It may prove fortunate, therefore, that the Bureau of Mines has recently had its attention called to large deposits of pure calcite in Montana, lying in two veins, 4 to 7 ft. wide, and probably 100 ft. deep and several miles long. While no crystals have yet been obtained which are perfectly clear, it is thought that with more careful mining a better product can be obtained. Though the demand for this spar is quite limited, a certain amount of it is necessary for making saccharimeters, polarizing microscopes, and other instruments.

BUSSES TAKE FARM CHILDREN TO AND FROM TOWN SCHOOLS

Rural free delivery of farmers' children between their homes and urban educational institutions is the interesting system by which the abolition of country schoolhouses has been effected in Howard County, Ind. The plan gives boys and girls in agricultural districts the same advantages as are afforded their town cousins. The abandoned schoolhouses have been converted into granaries, poultry houses,



Installation of Rural Bus Service for Farm Children Has Closed the Once Picturesque Red-Brick Schoolhouses in the County

and implement shelters. Inclosed busses, stove-heated in wintertime, are supported by the county and operated on regular morning and evening schedules.

TRAINS OF TRUCKS MOVE FLEET MEN'S OFFICES

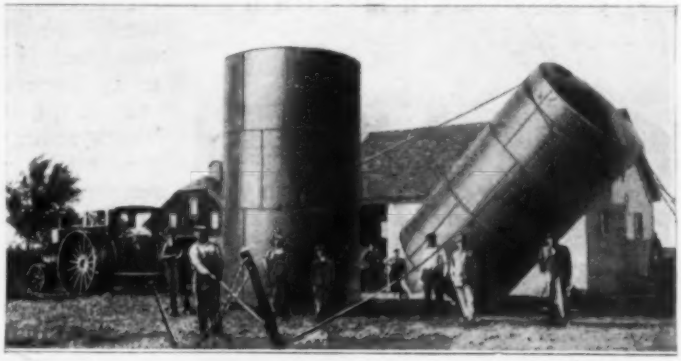
The bigness of the Emergency Fleet Corporation, as well as the dispatch with which it can do things, was revealed recently when the offices of this government concern were moved from Washington to Philadelphia. The office furniture and documents made 250 truck loads and were gathered from quarters in 22 different buildings in the capital. The new offices have been concentrated in three buildings. On the first moving day two trains of army motor trucks, composed of 32 and 30 machines, respectively, arrived in Philadelphia. Even army officers were astonished when the first train was unloaded in 32 minutes, while a good share of the second one discharged its cargo in 20 minutes. Occupying the offices is a staff of some 2,800 persons for whom homes had to be found.

GERMANS MAY OBTAIN OIL FROM WILD PLANTS

The discovery of a fat which can be recovered from plants now abundant in waste lands, is reported in Germany. Hundreds of thousands of gallons of this oil, called "edaphon," are obtainable, it is said. The discoverer asserts that he has found a process by which the oil can be extracted without using alcohol, thereby overcoming a difficulty which it was thought might postpone its use until after the war. The product is compared favorably with coconut oil.

OIL TANK STOOD ON END BY BIG FARM TRACTOR

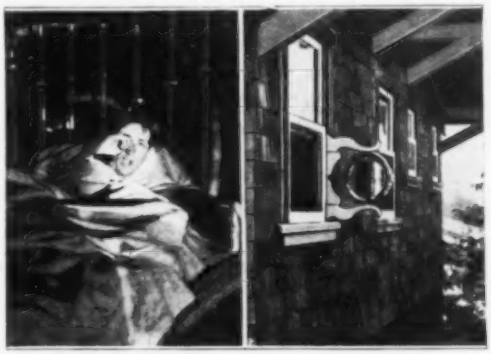
Farm tractors are often assigned to queer jobs. An instance of this kind recently attracted attention in a Kansas oil field where two seven-ton steel tanks were tipped on end as easily as if they had been tomato cans. The containers had been shipped in sections and assembled at the field. When it came time to set them in upright positions, the services of a farm tractor were enlisted.



The Big Farm Tractor Stood the Tanks on End as Easily as if They had Been Tomato Cans

RAYS OF MORNING SUNLIGHT USED AS SILENT ALARM

Many folks have an inherent aversion to the sharp, unrefined command of the businesslike alarm clock. It is not surprising therefore to find a man



The Effect of the Silent Alarm Clock is Seen at the Left, and, at the Right, is Shown the Mirror That Reflects the Sun's Rays upon the Face of the Sleeper

who has devised a silent slumber meter. He lives in what is advertised to tourists as "the land of perpetual sunshine." Mounted outside of a south window in his bedchamber is a large, round mirror with its face turned eastward. As the sun's rays first burst over the roof of an adjacent building, they strike the glass and are reflected into the eyes of the sleeper. As suntime changes, the position of the mirror is altered to effect the necessary correction.

DUTCH HALT SAND DRIFTS WITH GRASS TUFTS

In parts of Holland where quantities of fine sand are utilized in making railway embankments, it has been found

Railway Embankment in Holland, Made Mostly of Sand, Planted with Tufts of Grass to Prevent the Wind Blowing the Sand Away

that the high winds will drift freshly piled sand to such an extent that the roadbed is injured. To prevent this the Dutch, with infinite pains, plant the slopes with tufts of grass set a uniform distance apart. These immediately stop the drifting of the sand and gradually spread out their roots until the entire surface of the slopes is well sodded.

NEW TOOL STEEL MADE WITHOUT TUNGSTEN

After some years of experimenting an English firm has announced that it has produced a tool steel equal in durability and hardness to high-speed steel, but which does not contain tungsten. The new alloy is made by adding cobalt to chromium-carbon steel and possesses the red-cutting hardness so essential in tools. It is called cobalt-chrome, and is hardened at a temperature several hundred degrees lower than that required to get the best cutting efficiency from tungsten high-speed steel. In fact, most milling cutters and other tools in the engineering world are still manufactured from carbon steel, it is said, because of the difficulty experienced in hardening tungsten at the necessary high temperature. Tests seem to indicate that the new product is suitable for twist drills, reamers, taps, automatic forming tools, screw cutting, machining gun metal and yellow metals, as well as for high-endurance drawing and blanking dies, lathe centers, shear blades, and so on.

AUXILIARY HOOKS ARRANGED TO HELP HOLD FISH

Of possible interest to the amateur fisherman is a new hook arrangement intended to give a stronger hold on a large fish than is afforded ordinarily. The bait hook is held in position on the leader of a multiple hook by means of a friction device. When a fish takes

When a Fish Bites, a Quick Jerk on the Line Causes the Multiple Hook to Engage It

the bait, a quick jerk draws up the cluster so that one of its members engages the underside of the mouth.

¶A hotel is being erected in Washington by the Y. W. C. A. for the benefit of girls and women who come to the national capital to engage in war work, or other activities. It is intended that this hotel, which will accommodate 150 persons, will be used only as a temporary headquarters while search is made for permanent accommodations.

A Cataract of Water Poured from the Burning Building and Converted the Street into a Small Lake in Which the Fire Apparatus Stood Hub-Deep

WATER POURED ON FLAMES INUNDATES FIREMEN

Firemen labored under peculiar difficulties while fighting flames that recently threatened the destruction of a warehouse at Detroit. The apparatus was stationed in a depressed part of an adjacent street that passes beneath a railway viaduct. Thousands of gallons of water poured into the building, standing on higher ground, rushed like a cataract through one of the doorways of the structure and surged into the street. With the sewer overtaxed, the depressed part of the street rapidly became a small lake, in which the fire trucks stood hub-deep.

FLIGHT OF CONCRETE STEPS BUILT AS FIRE ESCAPE

At the rear of a frame building that serves as a public-meeting house for citizens of a small New York town, an outside reinforced-concrete stairway has been built as a fire escape. It consists of more than a score of steps and a landing of ample size, upheld by heavy supporting walls and supplied with an iron-pipe railing. The structure was erected at moderate cost and fills its purpose quite as well as would conventional steel equipment of less capacity and considerably greater cost.

By Constructing the Outside Stairway of Concrete, a Dependable Fire Escape was Provided at Nominal Cost

MANY NEW YORKERS DEVELOP TASTE FOR HORSE MEAT

To outward appearances at least, New York is becoming somewhat Parisian in its ways. For instance horseflesh, which French chefs have a knack of preparing in a most savory and appetizing manner, is meeting with the approval of many of Gotham's householders and therefore is enjoying ready sale. For some little time markets devoted exclusively to the retailing of horse steaks, chops, rib roasts, and sausage have been in operation, and of late new shops of the kind have been opened.

One of New York's New Horseflesh and Sausage Markets Which Enjoy Growing Patronage

FRANCE, NEEDING SWEETS, MAY RAISE SORGHUM

The sugar shortage in France has revived the interest of the French in sorghum, the cultivation of which would furnish a sirup that would be a satisfactory substitute for sugar. Formerly efforts were made to introduce sorghum, which thrives in the Mediterranean district, but not until the war destroyed the numerous sugar refineries in the north of France has the idea received much consideration. The sirup may be extracted from the stems with a fruit press.

BARGES ARE AGAIN TO PLY OLD INLAND CANAL

Transportation by water from the Great Lakes to the Illinois and Mississippi Rivers is to be resumed. Congress has appropriated $150,000 for defraying the expense of certain dredging operations which, when completed, will make the Illinois and Michigan canal serviceable. The Illinois state superintendent of waterways has announced that the work will be rushed so that the opening of the passage will expedite the movement of grain stored in large quantities along the Illinois River. As an aid in the transportation of coal, the canal is expected to prove important in expediting shipments.

AUTOMOBILE OPERATES PUMP DURING SPARE TIME

Some one is eternally finding something new for the motor car to do. This time it is the operation of an ordinary back-yard pump. Encountering an emergency, a westerner bent an iron bar to a modified U-shape and bolted it at opposite ends to the rim of the left rear wheel of his car. Near the end he loosely bolted a bar that had been pivoted to the pump handle. Then jacking up the rear of the car and starting the motor, he worked the pump at a clip it had never known before.

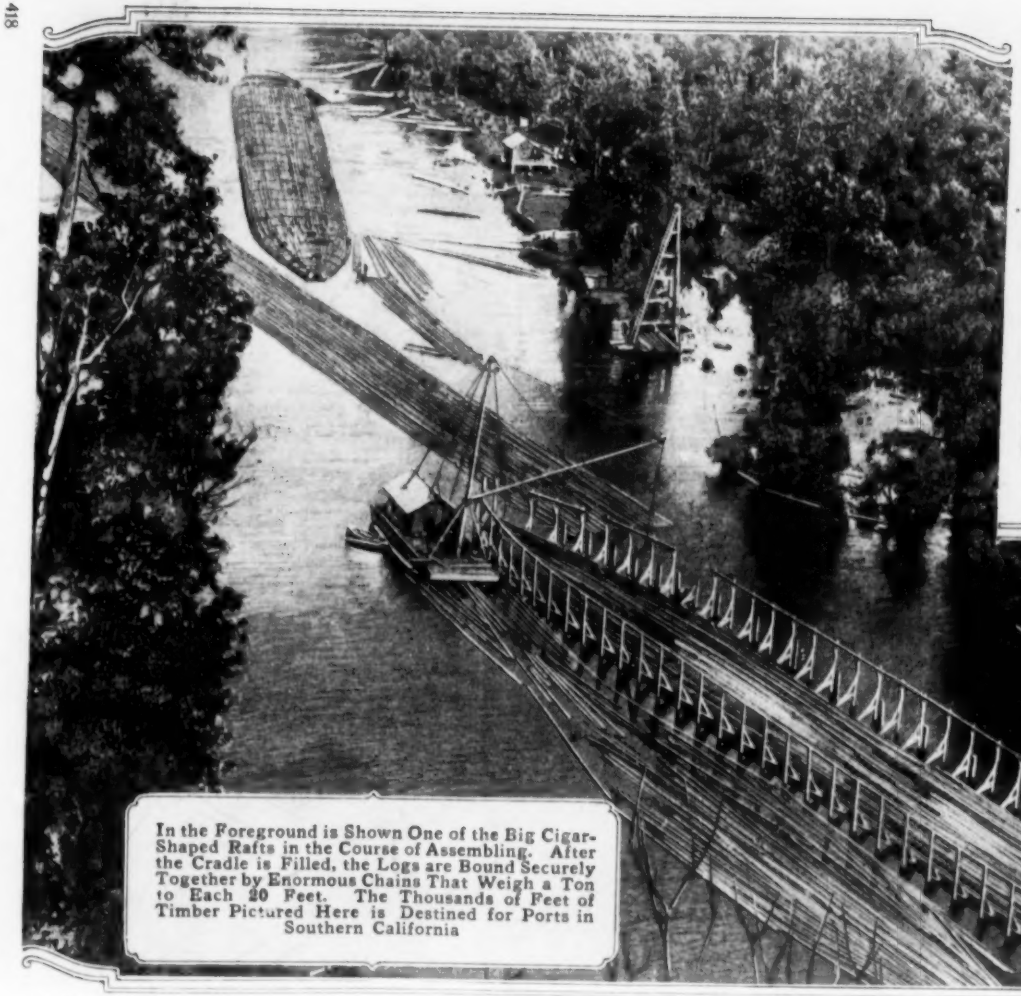
SPRUCE PRODUCTION SETS WORLD RECORD

Riving Spruce Logs in the Woods to Facilitate Transportation to the New Cut-Up Plant That has been Established at Vancouver: Thousands of Soldiers are Engaged as Loggers

Washington and Oregon are Now Supplying Virtually All the Spruce for the Air Craft of the United States and Its Allies. Big Trees, Like the One Pictured at the Side, Which Is 11½ Feet in Diameter, are being Felled by the Thousand

Only the Highest and Best Parts of Carefully Selected Trees Supply the Straight-Grained Wood Needed for Aeroplane Construction. In the Foreground Are 80-Foot Timbers Intended for Struts

PHOTOS BY GIFFORD & PRENTISS, INC., PORTLAND



In the Foreground is Shown One of the Big Cigar-Shaped Rafts in the Course of Assembling. After the Cradle is Filled, the Logs are Bound Securely Together by Enormous Chains That Weigh a Ton to Each 20 Feet. The Thousands of Feet of Timber Pictured Here is Destined for Ports in Southern California

Stimulated by the War's Unprecedented Demands, the Lumber Industry in the Northwest has Become Gigantic. This Shows an Ocean-Going Raft of Timber in the Columbia River

PHOTOS BY GIFFORD & PRENTISS, INC.

RIVING AND BUCKING AEROPLANE SPRUCE

The Government is Now Demanding for Aeroplane Use 11,000,000 Feet of Spruce Each Month. This does Not Represent the Gross Cut, for Only 15 Per Cent of the Log is Employed. Thus One Gains a Faint Idea of the Enormous Scope of the Work in Hand. At the Side is Shown How the Riving of Massive Logs is Accomplished. By Doing This Work in the Woods, Thousands of Cars are Saved for Other Purposes

Aeroplane Spruce is Scattered in Forests Extending 2,000 Miles along the Coast. The Task of Picking the Proper Trees, Felling Them, Riving the Logs, and Transporting the Pieces, All at Unheard-Of Speed, has Written New Romance in Northwestern History. Above, Bucked Spruce is Shown

Spruce Logs in Transit: Under the Supervision of the Spruce-Production Division of the Signal Corps, the Requirements of the United States and Its Allies have Not Only been Met, but the Production Cost has been Reduced from as High as $15. to $1.34 a Thousand Feet

PHOTOS BY GIFFORD & PRENTISS, INC.

CHURCH TOWER IS CLOTHED IN HEAVY MANTLE OF IVY

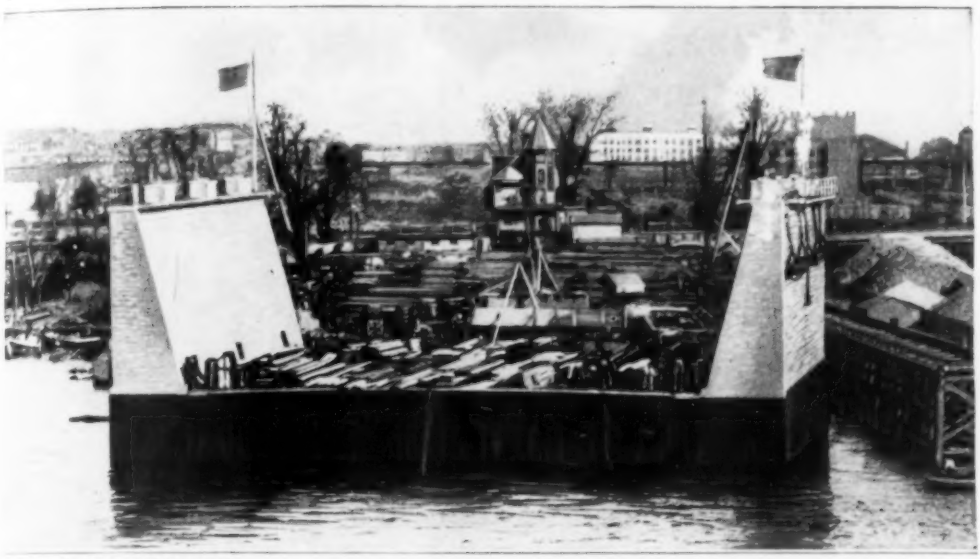
Travelers rarely fail to be impressed by the novelty and natural beauty of the ivy-covered tower and belfry of a small frame chapel that stands on a hillside at Tacoma, Wash. Planted some 10 years ago, the vines have grown luxuriantly and now completely conceal the four sides of the structure, which rises to a height of about 50 feet. At the top the foliage has been so trained and trimmed that it has the appearance of a massive bell.

Some Ten Years Ago a Few Scraggy Slips of Ivy were Planted about the Base of the Tower, Which Today is Burdened by a Dense Growth of Greenery That Completely Conceals It

BIG REFRIGERATOR TRAILER HANDLES MEAT SHIPMENTS

One of the Chicago packing companies has solved its city transportation problem by putting in service a tractor and refrigerator trailer equipment for distributing fresh meats between its plants and branch houses. Heretofore such shipments have been made by rail. Owing to freight congestion, however, inauguration of the motor system is effecting a material saving in time. The trailer, of 12-ton capacity, is built of steel and wood, lined with cork, and supplied with a cooling plant that does not require the use of brine or other liquids. The beef chamber is slightly more than 21 ft. in length and 6 ft. in width. In appearance the trailer bears a certain resemblance to a freight car. It is supplied with side and end doors and at the front is equipped with jacks for support when it is detached from the tractor. Two trailers of this sort are handled separately by one tractor. While one of them is being loaded or unloaded, the other is in transit. Thus the tractor's time is fully utilized.

Side and End Views of the Refrigerator Trailer Used in Transporting Meats from Plants to Branch Houses by a Packing Company



COPYRIGHT BY UNDERWOOD & UNDERWOOD
Launching One of the Six Sections of a 700-Foot Floating Dry Dock, Half of Which will Soon Be in Use at an American Port

ONE HALF OF BIG DRY DOCK NEARS COMPLETION

Within a short time the first three sections of a new six-section, 700-ft. dry dock, now under construction, will be in operation. When completely assembled the floating structure will provide accommodations for a vessel as large as the "Mauretania," or two ordinary tramps. The dock is to be electrically operated and so adjusted that a ship can be floated in from seven to ten minutes, or lifted out of the water in from 20 to 30 minutes.

DRIVER PREVENTS TRAGEDY BY QUICK SPURT OF SPEED

Were accelerators commonly sold as special equipment for the motor car, this story of an averted accident might well form the basis of an accessory advertisement. While driving across a wooden bridge some weeks ago, a motorist heard the timbers beneath him creak alarmingly. Instinctively, he gave his car gas. The quick burst of speed saved him and his three passengers from almost certain death. The bridge collapsed, but as it did so the automobile balanced on the edge of the abutment, its front wheels free from the roadway and its rear wheels in mid-air. The occupants escaped from

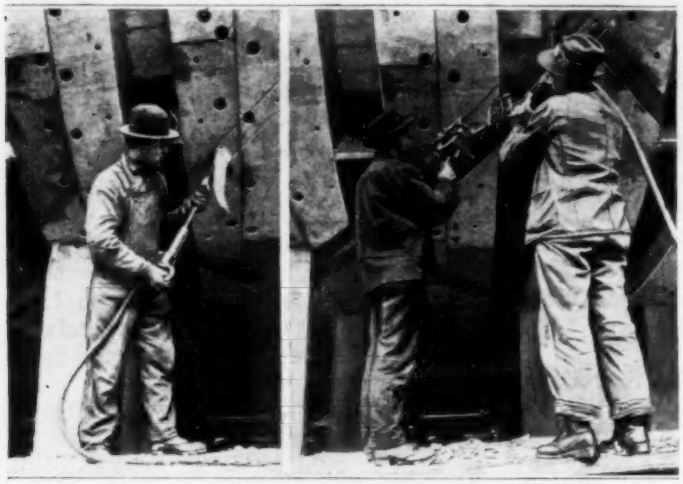
The Touring Car Balanced on the Edge of the Gulch When the Bridge Suddenly Collapsed

the machine by crawling out over the hood.

¶An automobile was recently blocked up in a show window, connected by belts with an electric generator and subjected to a test nonstop run lasting 47 days. It "traveled" 26,149 miles, averaging 22.49 miles per gallon of fuel.

PNEUMATIC STRAPPING SAW BOON TO SHIPBUILDERS

Much credit for the remarkable speed with which wooden ships are being constructed is due to the development of special labor-saving electric and pneumatic tools. Among the most recent of these is an air-driven strapping saw that permits two men to do as much work as 20 can do with tools heretofore employed. The instrument, which has been adopted at a number of shipyards during the last few months, is fitted with two saws that may be adjusted to cut to depths of from ¼ to 1⅝ in. Horizontal regulation of the blades up to a maximum width of 4 in. is also possible. After the parallel seams are cut, battens for the strapping irons are quickly excavated with pneumatic chisels.



The Air-Driven Strapping Saw, Shown in Operation at the Right, Makes Two Parallel Cuts. The Batten is Excavated Quickly with the Aid of a Pneumatic Chisel, as is to be Seen at the Left

FRANCE SAVES MOTOR FUEL BY STRIKING ECONOMIES

In the French army various interesting practices are being observed for the purpose of conserving gasoline, which is none too plentiful anywhere in Europe at the present time. For instance, where there are several empty trucks that are being dispatched to one point, they are connected by tow lines. One of the machines then serves as tractor to reduce fuel consumption to the minimum for the trip. Trailers, particularly two-wheeled ones, are also coming into rather extensive use wherever it is practicable to employ them. When an empty truck and a passenger car are making the same tour, it is customary for the latter to be loaded and carried, instead of being driven under its own power. This idea is understood to have been adopted by the American forces as well as the French. Perhaps the most striking of all the fuel-saving schemes is the reported use of oxen for maneuvering machines into line when a caravan is being made up. When trains of new trucks are to be dispatched from Channel ports to Paris, or from Italian factories to some other French city, it is customary for public announcement to be made so that citizens, wishing to make shipments to points along the route, may deliver their goods to military authorities at the starting point, or some intermediate station, and have them taken in hand.

SPECIALLY DESIGNED TENT SERVES LARGE FAMILY

For the outer, sportsman, and motorist, a compact large-capacity tent has been brought out. It consists of a wood-and-metal framework covered with canvas and supplied with seats, cots, a table, and a clothes rack for the accommodation of as many as six persons. Arranged for the night, the tent's cots are supported in a triple tier. Each is wide enough for two persons. According to the wishes of the users, the tent may be adjusted to form either a fully inclosed shelter, or a canopy. The latter is well suited as a

The Picture Above Shows Two of the Ways in Which the New Tent for Outers may be Used. At the Left It Offers Complete Shelter; at the Right It Is a Canopy, Suited for Warm-Weather Uses. The Arrangement of the Cots Is Also a Point of Interest

sunshade or a wind screen at mealtime, and as a lounging place during the daytime. Packed for transportation, the outfit forms a bundle 8 in. square and 7 ft. long.

WASTE WASH WATER USED FOR IRRIGATION

The plumbing in recently erected California homes is decidedly novel in that the drains from the bathtubs, sinks, washbowls, and laundry tubs are used to lead the waste water from the house into a system of tile drains for the irrigation of lawns and gardens. Quantities of water heretofore wasted can be used to good advantage, and at the same time the amount purchased for irrigation is reduced. The small amount of soap and organic matter contained in solution, instead of being harmful, is said to be slightly beneficial to the soil. Auxiliary connections are provided in the drain pipes for use during the rainy season, by which the water can be diverted into the sewers.

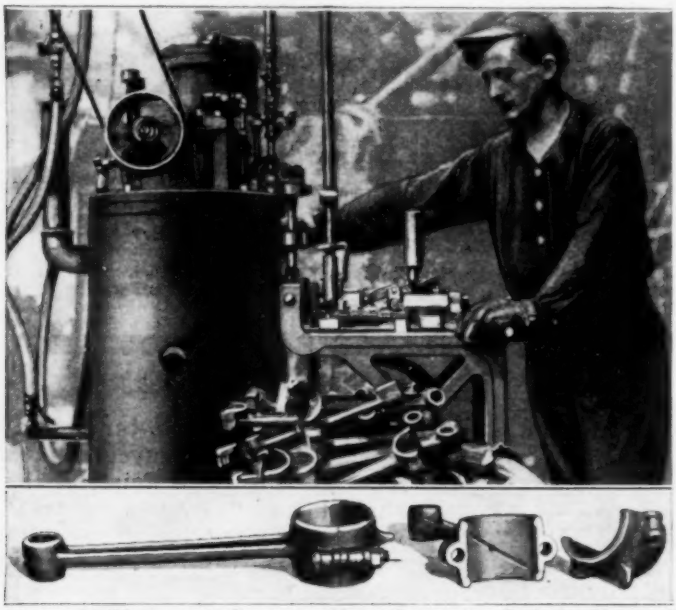
VILLAGE ENTERS SOLDIERS' NAMES ON HONOR ROLL

An honor roll of simple but appropriate design has been unveiled in a small New York town in honor of the 66 sons which it has given to the great war. The names are lettered in white against a dark background under the caption, "With the Flag," above which is a replica of our national emblem. The board stands in a public park and is illuminated at night. The names of the men who die in the service are to be relettered in gold.

Honor Roll of Simple, Pleasing Design, Erected by a New York Community in Recognition of the Sons It has Given to the War: The Names of the Men Who Die in the Service will be Lettered in Gold

CONNECTING-ROD BEARINGS RENEWED BY DIE-CASTING

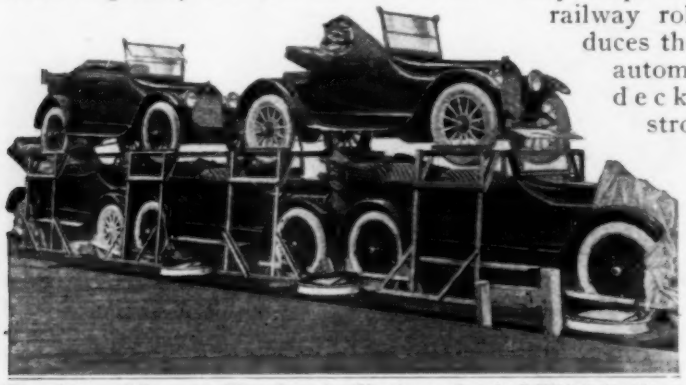
Worn and cracked connecting-rod bearings are being replaced by a die-casting process at one motor-car factory. Instead of having a new babbitt fitted, a motorist exchanges the damaged rod for a good one at a service station. A nominal charge is made for this, and the old member is sent to the factory. After being machined, the cap is severed and the bearing seat tinned. The rod is then placed in a special casting machine and the molten babbitt metal poured. When cold, the bearing is tested for air holes, and if found to be perfect, is broached, reamed, and trimmed until the metal is absolutely secure and smooth. Several advantages are claimed for the die-cast babbitt in addition to the cost element. Experience has shown that it will not work loose or crack, that it has longer life than the fitted babbitt, and is superior in some other respects, it is asserted.



Above, the Workman is Repairing Worn Connecting Rods by Means of the Die-Casting Process, Which is being Found More Satisfactory than having New Babbits Fitted. At the Bottom Some of the Work is Shown

DOUBLE CARS' CAPACITY FOR CARRYING AUTOS

Steel decks are now being used by many automobile manufacturers in order to greatly increase the normal capacity of railway cars for carrying automobiles. Use of this equipment not only helps to relieve the shortage of railway rolling stock but also reduces the freight charges on each automobile so shipped. The decks are supported by strongly braced angle-iron uprights and permit the placing of one car immediately above another. They double the capacity of a gondola or flat car, and increase the capacity of a box car 60 to 70 per cent. When not needed these steel decks can be easily removed.

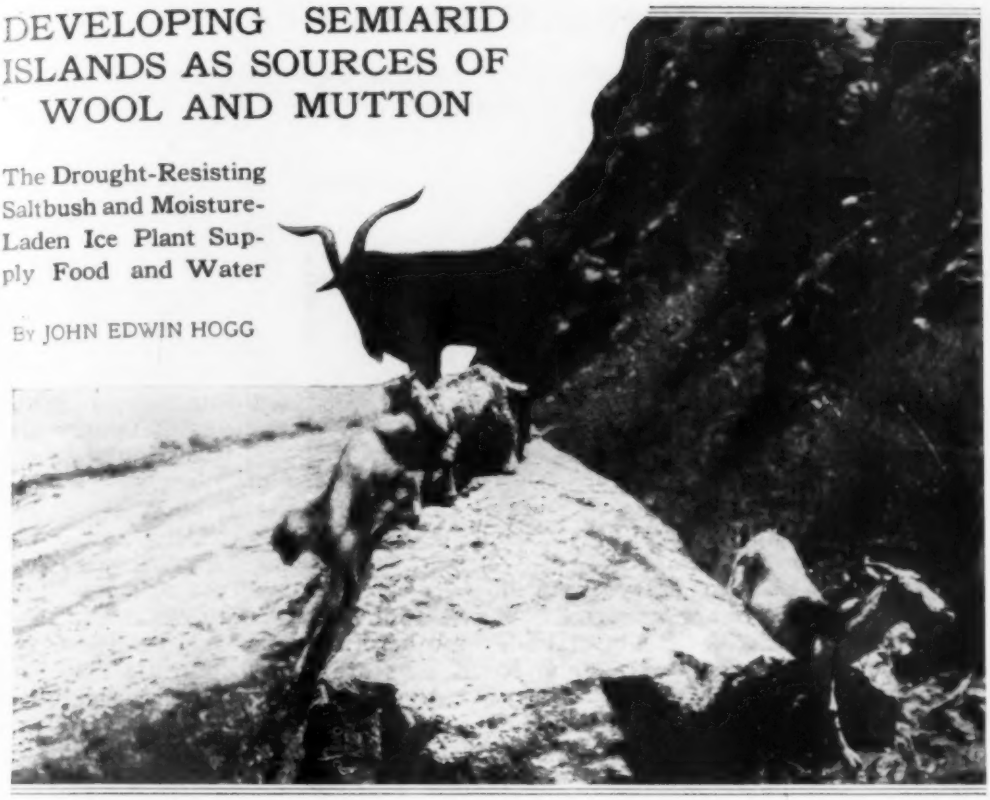


Five Automobiles on a Flat Car, the Maximum Load of Which has been Three, Heretofore: With the Steel Decks Which Make the Increased Load Possible a Sixth Automobile could have been Added if So Desired

DEVELOPING SEMIARID ISLANDS AS SOURCES OF WOOL AND MUTTON

The Drought-Resisting Saltbush and Moisture-Laden Ice Plant Supply Food and Water

By JOHN EDWIN HOGG



Wild Goats and Kids on Santa Catalina Island, Photographed by a Hidden Camera Operated Electrically from a Point 600 Yards Distant: It is Estimated That the Santa Barbara Group of Islands Has 100,000 of These Wild Inhabitants at the Present Time

RAISING thousands of sheep on islands where no fresh water exists, exterminating wild goats to make pasture for domestic herds, and securing water where none has been deemed obtainable, are some of the achievements wrought in a group of semiarid Pacific islands as a partial answer to the present world shortage of meat and clothing.

In former years these rugged islands, the Santa Barbaras, off the coast of southern California, produced little of greater commercial importance than wild goats and sea lions. Today their products are so essential that the government has permanently exempted from military duty all men of draft age who are engaged in the new ranching industries.

The Moisture Stored in the Leaves and Stems of the Ice Plant, Here Pictured, Enables Thousands of Sheep to Live on Islands Where Fresh Water does Not Exist

All of these islands are extremely mountainous. On the larger ones, such as Santa Rosa, Santa Cruz, and Santa Catalina, an abundance of fine fresh water has recently been obtained by boring wells in the bottom of deep cañons. On San Clemente, and a number of other islands, the search for water has met with only partial success. The water that has been obtained is either too brackish to be of use, or is limited in quantity. Ana Capa, and several of the smaller islands, have thus far defied all attempts in the production of fresh water. Here sheep and wool-bearing goats are reared wholly without water.

As a substitute for water these islands have been sown with vast areas of thick-leafed desert vegetation com-

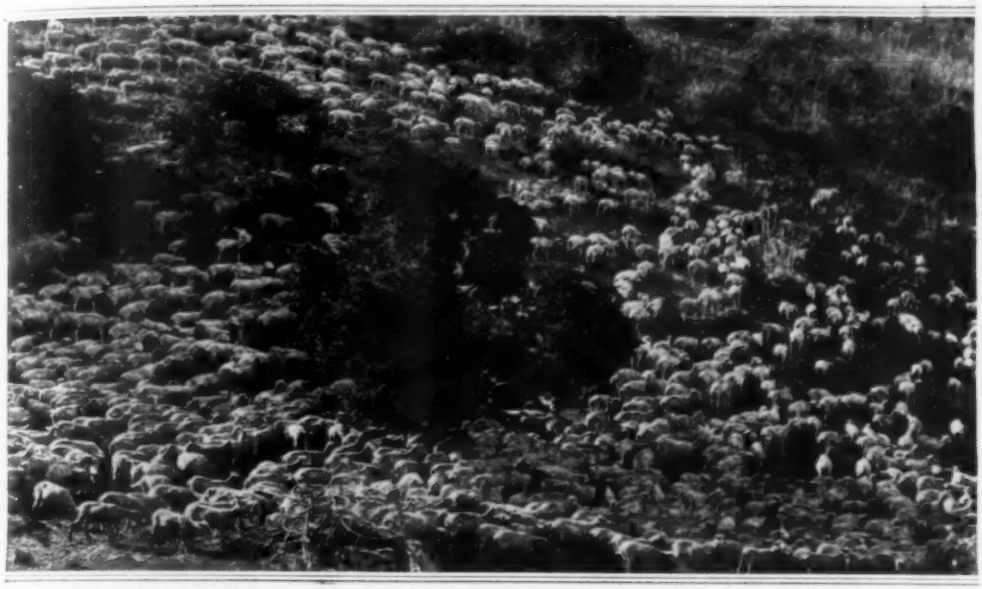
monly known as ice plant. It is so called because of its peculiar process of storing up great quantities of moisture in its thick, spongy leaves and stems. This moisture is constantly exuded on the surface of the leaves giving them the appearance of being covered with flakes of ice. The resulting evaporation makes the plant feel cold to the touch, even during the hottest days of the long, arid summer. Sheep at first refused to eat the ice plant, but when driven by thirst munched it with little hesitation. Enormous herds now thrive upon it and with no water whatever.

Angora Goats on San Clemente Island Thrive and Produce Much Wool, Although the Pasturage Is Miserably Poor and Water Exceedingly Scarce

In the matter of transportation, the island sheep ranches are especially favored. From the most distant point in the group to the mainland it is but a few hours' sail with privately owned lighters. The islands, because of their mountainous character, have numerous deep cañons running down to the sea, and the mouths of these form excellent sheltered harbors usually quite convenient to the various ranches. Shipment of supplies to the herdsmen, and of wool and mutton to market, is thus effected with even less difficulty than ordinarily attends transportation to and from inland estates. Communication between the islands and the mainland has been established by wireless.

Sheep do not mature as heavy a crop of wool in the balmy climate of these southern isles as in regions where conditions are more rigorous. This loss, however, is said to be more than offset by reason of a much lower death rate among the herds. Ranchmen of the Santa Barbaras have no blizzards to contend with, their sheep and lambs never freeze to death nor starve because snow and ice covers their food for weeks, and there are no wolves or sheep-killing dogs. Barring death from

The Middle Ranch, the Center of the Sheep-Raising Industry on Santa Catalina Island, Where Large Flocks are Herded: The Development has been Made Possible by the Drilling of Artesian Wells in the Bottom of the Cañon



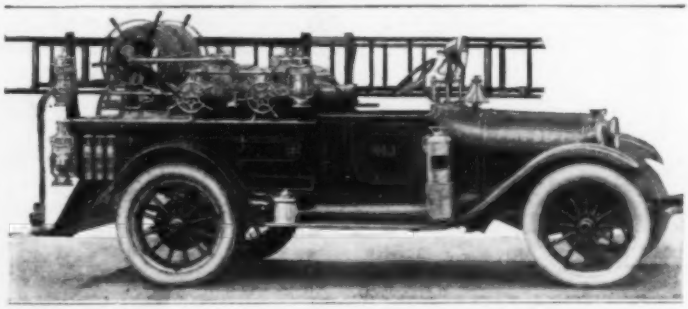
Sheep on Ana Capa Island Are Entirely without Water during the Dry Months, May to December, and Live by Munching the Cool, Moisture-Laden Leaves of the Ice Plant, Which Grows in Sufficient Abundance for Their Needs

disease or accident, every sheep taken to the islands and every lamb born there lives to produce wool and mutton.

Experiments are now being made in the islands with several varieties of drought-resisting pasture plants that have been imported from Australia. The most promising of these is the Australian saltbush which has been introduced on Santa Catalina and San Clemente islands with very good results. The success of cultivating these plants will provide an abundance of food for the great herds of sheep during the long summer when the hills become so parched that pasturage is scarce.

FIRE TRUCK IS MAINTAINED AT LARGE FACTORY.

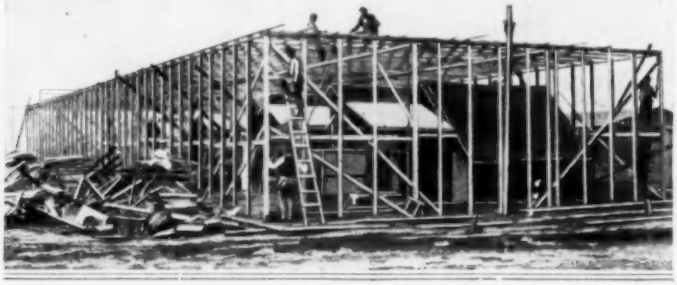
At one big modern factory, where the doctrine of preparedness is practiced, a private fire department is maintained. It consists of a motor car fully outfitted with fire-fighting paraphernalia, including ladders, extinguishers, chemical tanks, and 250 ft. of hose. The factory is composed of reinforced-concrete buildings supplied with automatic alarms and sprinkler systems. The truck equipment therefore is not necessitated by great fire hazard, but by the demands of efficiency. The apparatus includes large chemical tanks, portable extinguishers, and other conventional equipment.



This Truck, Built on the Chassis of a Standard Pleasure Car, Protects a Manufacturing Plant by Being at Hand to Quench Possible Fires in Their Incipient Stage

ARMY BAKERY IS INCLOSED BY SCREENED BUILDING

One of the mid-western National Army cantonments has the distinction of possessing a fly-proof bakery of rather unusual character. The commander of the camp, formerly stationed in the Canal Zone, has an inherent hatred for flies and other germ-bearing insects. Therefore, on his initiative, the bakery was inclosed by a substantial framework entirely covered with wire screening.



To Screen the Camp Bakery, Which Serves 45,000 Soldiers, Necessitated the Erection of a Skeleton Building of Large Proportions

GOVERNMENT ASSAY OFFICES WILL BUY OLD GOLD

Those who have old gold and silver, in quantities approximating $100, which they wish to convert into money for war or other purposes, may dispose of it by sending it to the United States assay office at New York, Philadelphia, Denver, or San Francisco. It should not be addressed to Washington. Upon receipt of the metal, the shipper will be forwarded a check on the United States treasury, covering its value less nominal charges for coinage.

TRACTORLIKE WHEELS EQUIP CAR FOR MUD

Various schemes have been advanced for assisting motor cars in negotiating deep sand and mud. Light, perforated and cleated steel rims of broad tread, which fit over the wheels after the tires have been removed, constitute one of the latest methods that has come to attention. The device gives a car the appearance of being equipped with tractor wheels, which is the case.

The Broad-Tread, Perforated and Cleated Steel Tires Fit over the Rims of the Wheels and Enable the Car to Negotiate Sand and Mud More Easily than When Pneumatic Tires are Used

FIND SIMPLE WAY TO SAVE GREASE IN WASTE WATER

While the Germans have been forced by war emergencies to devise many ways of recovering grease from waste products, it is interesting to note that an American army officer has hit upon a simple and inexpensive method of extracting grease and fat from the waste water of army kitchens, etc. In the upper end of a barrel, which serves as a trap, is placed a crate containing a quantity of niter cake, a fused salt that is easy to obtain. A screen is placed above the crate and as the water runs through it, the fats are separated and rise to the surface, while the water flows from the bottom of the barrel through a pipe that is curved upward enough to maintain the desired level in the trap. As the fat collects it can be drawn off and removed to a reclamation plant.

A New Use for the Vacuum Cleaner: Gathering Potato Bugs by Suction—a Method That has Proved Much Faster Than the Old Way

MILKING MACHINES TIMED BY COWS' HEART BEATS

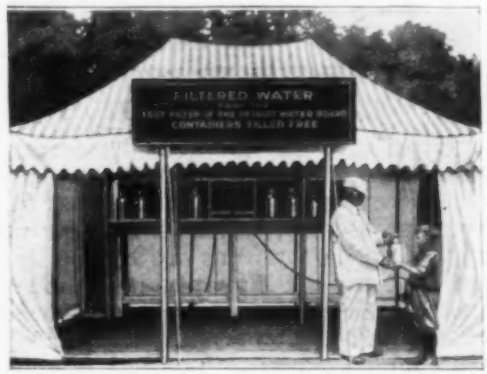
According to tests made by the Canadian government, milking machines to operate properly should take into account the heart beats of the cow. Examinations have shown that there is a relatively small amount of milk in a cow's udder at any one time. Many times that amount can be obtained in a milking because nature secretes the milk from the glands to which blood is supplied, as fast as the udder is emptied. The investigators making the tests referred to maintain that a milking machine should create a vacuum about 42 times a minute, tallying with the heart beats of the cow.

VACUUM CLEANER PROVES A FINE BUG PICKER

A resourceful gardener has utilized a vacuum cleaner in his war against potato bugs, and has found that household utility remarkably effective. The machine was equipped with the flexible tube used in cleaning draperies and was connected with a light socket by an extension wire. With this apparatus it was possible to gather the bugs many times faster than by the old way and with much less effort.

FREE FILTERED WATER FROM CITY'S TENT

To show the superiority of filtered water over the city's present water supply, the city of Detroit has erected a temporary filtration plant of small capacity and in connection with it maintains a filtered-water station, housed in a tent where water can be obtained without charge. Here is displayed a row of glass bottles containing samples of water which show the various stages in infiltration, so that the public can see



From This Tent the City of Detroit Supplies Filtered Water Free to All Who Come for It. The Samples on the Shelf Within Show Various Stages in Infiltration

for itself the improvement in the water that has been cleansed. People come from all over the city to have containers filled by the attendant in charge.

MOTORCYCLE EQUIPPED WITH TWO SIDECARS

A motorcycle with a right and a left-hand sidecar is the novel and very serviceable vehicle which is being driven by an Indiana motorcyclist. The idea of a "twin" was suggested to the owner when, by mistake, the manufacturers shipped him a left-hand sidecar, designed for foreign service. In attaching the two, the only variation from the usual practice was to omit one upright brace, permitting the necessary play when uneven ground is being traversed. The engine has ample power to drive the vehicle when all seats are occupied.

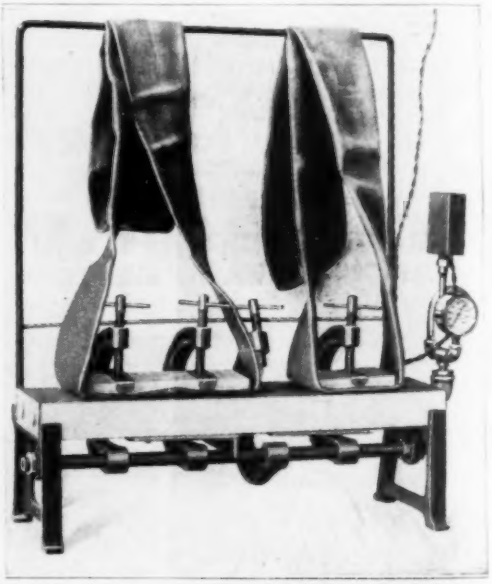
A Motorcycle with Twin Sidecars Which has Proven Entirely Practical to Operate and of Unusual Service to the Owner

RECOVER SILVER FROM ORE WITH RED-PINE OIL

Experiments by the Canadian forest-products laboratories have resulted in the discovery of an oil, obtained from red-pine stumps, which is valuable in recovering silver from ore by the flotation process. By this well-known method silver ore is pulverized, placed in a tank of suitable oil, and agitated by compressed air. The top film of the oil used possesses a marked affinity for the silver dust, so that the latter is easily separated from the worthless rock and can be skimmed off. Heretofore the oil utilized for flotation in certain mines has been obtained by redistillation of turpentine, procured in the hard-pine regions of the southern states. But this oil is increasingly difficult to obtain and so the discovery of the red-pine substitute is considered of much importance.

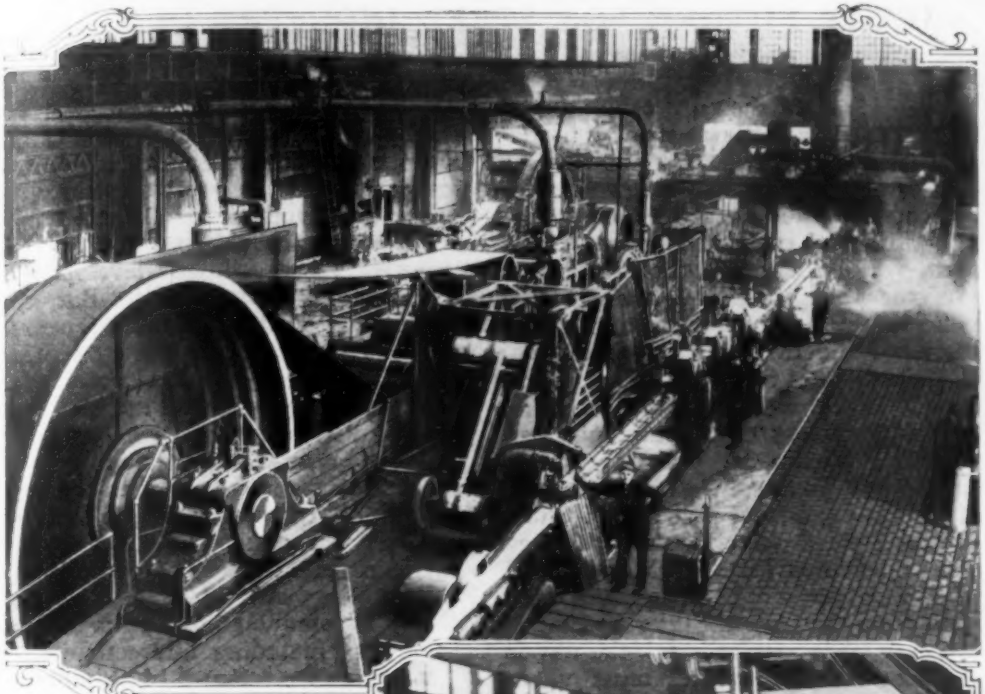
TIRE-VULCANIZING DEVICE IS SELF-CONTROLLED

For motor-car garages and tire-repair shops an automatic, steam-electric vulcanizing apparatus has been developed that is claimed to hold an even pressure automatically for any desired length of time. A heating element like that of an ordinary flatiron is used. About a pint of water is held in the plate casting, and this turning to steam prevents the burning of the tubes. An expanding spring-and-rubber regulator, installed in a housing mounted above the gauge, maintains the pressure at the desired number of pounds. Current may be taken from a lighting socket.



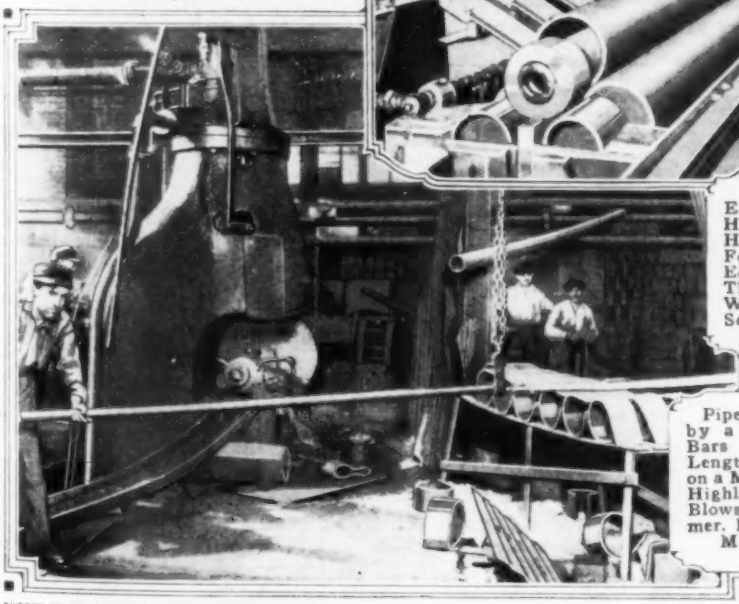
By Means of an Expanding Spring and Rubber in the Housing above the Gauge, the Pressure is Automatically Controlled

INTERESTING STEPS IN MANUFACTURE OF PIPE



Pipe is Made from Skelp—Long, Narrow Plates of Steel Rolled from Billets or Slabs. Strips Used for Small Pipe Are Sufficiently Uniform in Width to Obviate the Need of Shearing, but Skelp for Large Pipe is Carefully Trimmed. The Picture Above Shows a Modern Skelp Mill in Operation

After Scarfing the Edges, the Plate is Heated and Rolled, as Here Shown, to Pipe Form with the Beveled Edges Overlapping. Then It is Raised to Welding Heat and the Seam Squeezed between Rolls and a Mandrel



Pipe Couplings are Made by a Machine That Cuts Bars of Iron into Uniform Lengths and Forms the Pieces on a Mandrel. They are Then Highly Heated and Welded by Blows of a Quick-Acting Hammer. Here Couplings are being Made by This Process

PHOTOS BY COURTESY OF THE YOUNGSTOWN SHEET AND TUBE CO.

GREAT FUTURE FOR STEEL INDUSTRY IN CHINA

By F. H. WILLIAMS

IRON is one of the most easily mined and most abundant of all the natural riches in China, being a rival of coal in this respect. So vast and widely scattered are the ore deposits that a monopoly of the iron industry would seem very remote, and the prospective investor would do well to make a first-hand investigation of the situation because of the diversity of conditions. Within the last few years the pig-iron output in China has doubled, in spite of the crudeness of the methods employed. Within 10 years, Japanese capital has practically secured control of the iron and steel industry in China and has helped make Hankow as much a steel center as Pittsburgh or Gary.

While at present the Celestials draw heavily on the United States and Japan for their construction steel, the day is not far distant when they must manufacture it themselves. In the opinion of a leading steel man, the only question for American financiers, with respect to this development, is whether they are willing to invest in companies controlled by Chinese capitalists. If they make the mistake of demanding a majority of stock in new companies, they will get nothing at all.

Coke, so essential to the steel industry, can be easily obtained in China because the proper quality of bituminous coal exists in great quantities.

The development of the steel and other industries referred to lags because of slow railroad development. More capital is needed. But the Chinese are loath to let more Japanese capital be injected into the steel situation, and so here is an opportunity for Americans to work hand in hand with the Chinese.

To judge the whole situation properly one must know what Japan has been doing. Taking many German business methods as a guide, the Island Empire has developed a great export trade and while taking care of large war contracts, is planning for after-the-war trade, too, including intercourse with South America. Some of the largest American corporations have grasped Japan's relationship to oriental trade and are redoubling their efforts in the Pacific. American resourcefulness and American standards of trade ethics should be combined with Chinese ability and natural wealth to develop this great steel industry, to the profit of the Celestials and ourselves.

BEARS LEAD DOG'S LIFE IN ARCTIC REGION

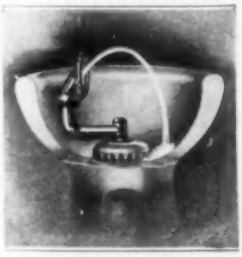
CIRCUS men are not the only ones to make profitable use of trained bears, as this picture taken in the arctic region indicates. White bears caught in the far North can be taught to pull big loads, but frequently it is necessary to hitch a dog with them to serve as a leader, for the savage animals seldom if ever become truly domesticated. When in a docile mood they may develop surprising laziness.

CONDENSED SIGNAL CHART FOR TRAINING JACKIES

To assist new men, who are entering the navy and merchant marine, in familiarizing themselves with the various signal systems in use, a study chart of convenient form and condensed arrangement has been introduced. It is an oval pasteboard of pocket size. On one side the two-arm semaphore code for machine and hand flags, and the Weather Bureau signals, are given. The reverse side presents the alphabetical flags of the international signal code, repeaters and indicators, call flags, ship-call pennants, "Very" signals, the navy dot-and-dash code, and other pertinent information. All of this is illustrated in colors. Rotary disks in addition are supplied to facilitate memorizing of positions and flags.

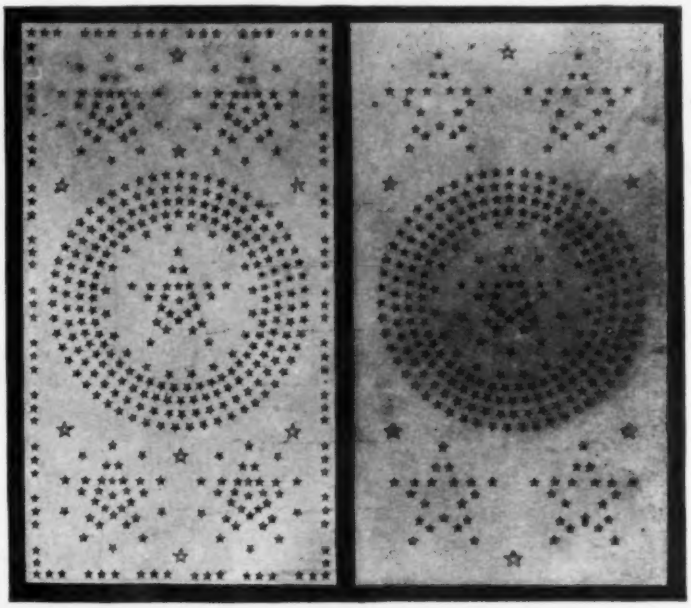
ARCHED STREAM INCREASES SAFETY OF PUBLIC FOUNT

For sanitary drinking fountains in public places a bubbler of new type has been introduced that throws a stream of water in the form of an arc. A protecting ring precludes the possibility of the user's lips touching any part of the nozzle with which water comes in contact. Likewise water cannot fall back on the bubbler as a person drinks. A regulating screw in a concealed place is employed for controlling the stream.



GROUP SERVICE-FLAG STARS IN FLEXIBLE DESIGN

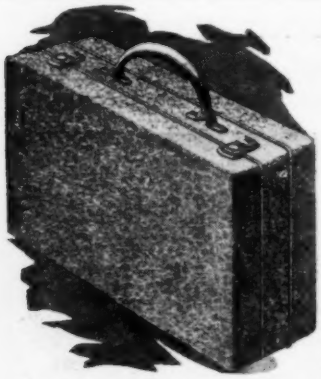
Community service flags are by this time perhaps fairly numerous, but



At the Left the Flag is Shown with 474 Stars, and at the Right with 344: The Two Pictures Explain How 130 Stars were Added without Destroying the Symmetry of the Design, and Also Indicate How Others may be Added without Materially Changing the Arrangement

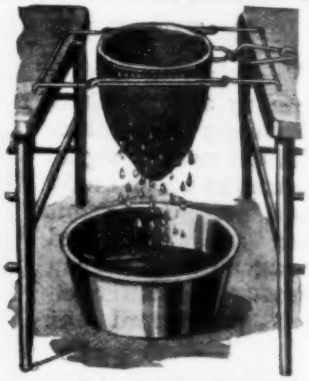
Meadville, a Pennsylvania town of about 15,000 inhabitants, has one that is somewhat distinctive. Its stars form a design, the symmetry of which is not disturbed by the introduction of additional ones from time to time. When last displayed it contained 520 stars. On its next public appearance it will bear nearly 600 stars. The banner is 21 by 33 ft. in dimensions and will accommodate as many as 761 stars without overcrowding the field or materially changing the arrangement. The accompanying illustrations—showing the flag at the time it contained 344 stars, and at a later date, when the number had been raised to 474—explain the plan followed. White centered stars honor fighters killed in action, while noncombatants killed while engaged in war work are designated collectively by a blue number borne on a white star superimposed on a blue one within the central star unit.

SOME NOVEL AND LITTLE-KNOWN ACCESSORIES



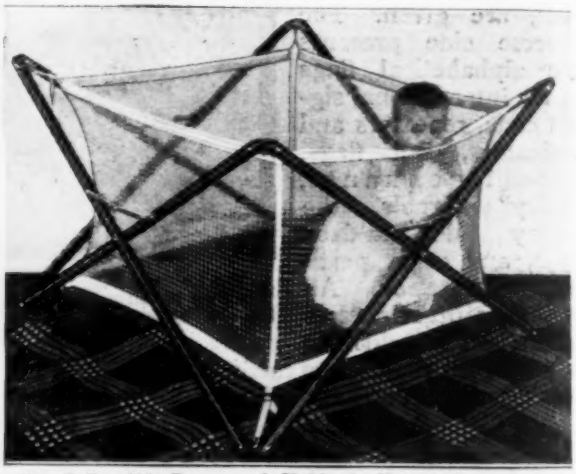
For Outers: A Rolled-Steel Bag That Passes for Leather and is Easily Kept in Sanitary Condition. Price $1.50

Flexible Metal Strap for Wrist Watches: Fits Snugly and Demands No Adjusting. Available in Silver and Rolled-Gold Plate



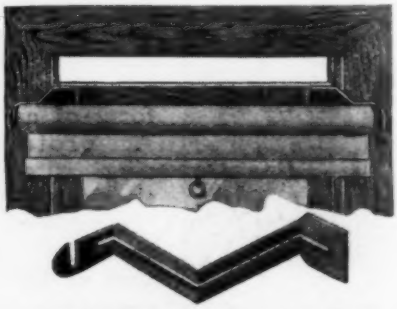
Adjustable Strainer That may be Used with Pots or Pans of Any Size, or Placed between Chairs, as Shown

Adjustable Running-Board Bracket for Motorists' Luggage: It may be Attached or Detached in a Moment's Time. Price $1.75



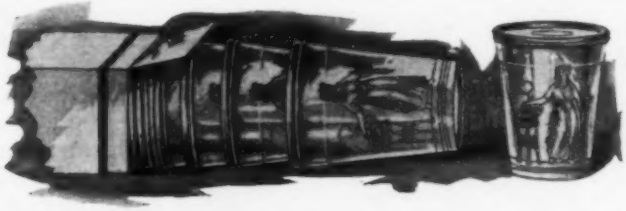
The Collapsible Framework Holds the Netting Taut, Forming a Pen in Which a Tiny Tot may Take Its First Steps in Complete Safety and without the Customary Hard Bumps

This Kitchen Stool Not Only Serves Handily as a Short Stepladder, but Also Is Convenient When Shoes are to be Polished

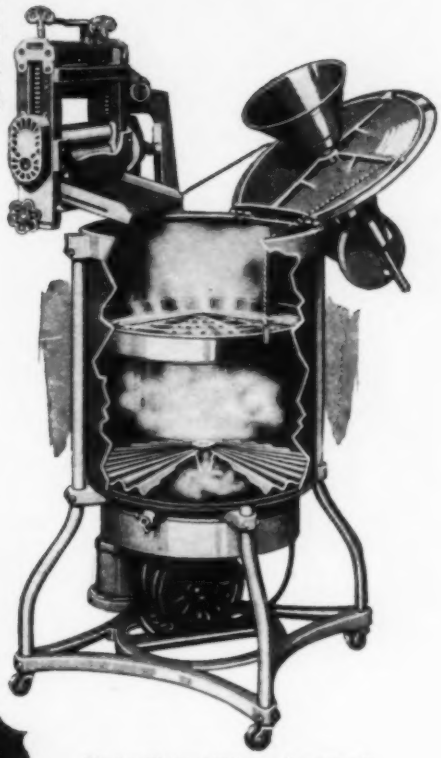


Special Bracket That Enables Shade to be Hung from Top of Window Sash, So That the Lower Part of the Window may be Screened When the Upper Part Is Open for Ventilation Purposes

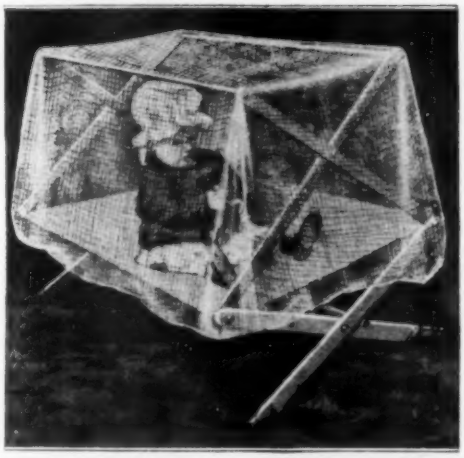
Small and Convenient Gasoline Stove for Sick Room or Camp: It Requires No Generating, and Burns an Hour with One Filling. Fits in Cylindrical Metal Case Five Inches High



The Prevailing High Price of Glassware Makes the Fiber Container of Possible Interest to Those Who are Preparing Jellies, Marmalades, and Jams for Winter Use



Motor-Driven "Steam-Laundry" Machine for Household Use: Work is Done in One Operation by Suction Process. Opening the Top Automatically Removes Clothes from Hot Water



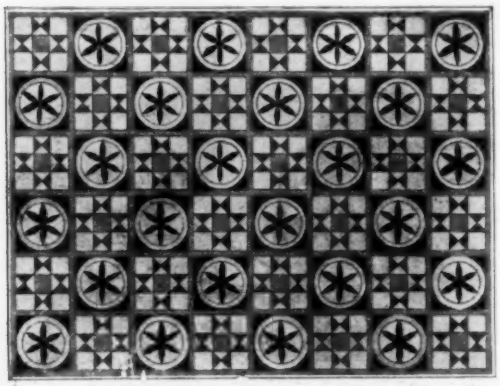
For Lawn, Park, Beach, and Camp: A Cot of Light Weight and, When Folded, Compact Size for Baby in Hot Weather. Price $3.50

Light Folding Crib Particularly Designed for Motor-Car and Hotel Use. Price $10

Simple and Easily Attached Safety Clasp for Cravat Pins: Device is Applied by Bending It So That the Lugs Engage the Pin. Price 25 Cents

CHINESE BOY DESIGNS OILCLOTH PATTERN

An American business man, recently in China, offered a small prize to the pupils in a Chinese public school for

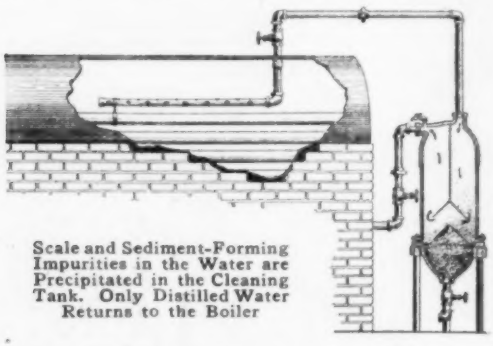


Four-Color Oilcloth Pattern Designed by a Chinese Schoolboy Seven Years Old: One of a Hundred Drawings Entered in a Prize Contest

patterns to use on oilcloth, the designs to be such as would please the natives. The one illustrated is a fair sample of about 100 which competed. It was made by Foo Tu Tsung, a Chinese boy five years of age (seven years as we count time). The original is in four colors, and attractive.

BOILER SCAVENGER CLEANS BY PRECIPITATION

Strong claims are made for the efficiency of a continuous-acting boiler cleaner of simple construction now be-

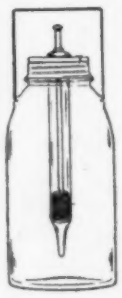


Scale and Sediment-Forming Impurities in the Water are Precipitated in the Cleaning Tank. Only Distilled Water Returns to the Boiler

ing introduced. A perforated skimmer pipe, about seven feet in length, is suspended approximately a half inch below the lowest water level. Scale and sediment-forming impurities in the water are sucked in by a circulating process and carried to a cleaning tank mounted at the rear. In this the incoming water must pass beneath the bottom of a dividing partition where there is uncirculated, and therefore cool, water. Precipitation takes place and the mineral and organic particles settle. Only distilled water returns to the boiler. The deposit that forms in the precipitator is blown out readily by opening a valve provided at the base.

BATTERY-FILLING OUTFIT MADE FOR CAR OWNER

For the motorist a storage-battery filling outfit of convenient form and good features has been developed. It consists of a two-quart glass jar, fitted with a dial cap that registers the date of the latest filling, and a hydrometer syringe, used for transferring the distilled water from the container to the batteries and for testing the solution. This arrangement not only keeps the water free from metallic contact, but also safeguards against the danger of dirt and grease being injected into the cells through the use of a dirty funnel.



URGE PHYSICIANS TO USE SODIUM, NOT POTASSIUM

Keen interest has been aroused among chemists and medical men over the claim that sodium and potassium are so similar that they can be used interchangeably and that German commercial propaganda has helped to create an unwarranted prejudice in favor of potassium. The potash industry has become highly developed in Germany largely because natural deposits there are in a form that is readily usable. Before the war Amer-

icans had come to believe that they were absolutely dependent on Teutonic sources for this product.

Since we have been cut off from these supplies we have begun to develop our own potassium industry, but it will be a long time before it can meet our various needs. For this reason physicians and chemists are being urged to discard their alleged prejudice against sodium as a substitute. The belief that potassium salts have an advantage over sodium salts as a therapeutic agent is unwarranted, it is said. Furthermore, the use of sodium releases potassium for preferred industrial needs, and, finally, sodium salts are much cheaper than potassium compounds.

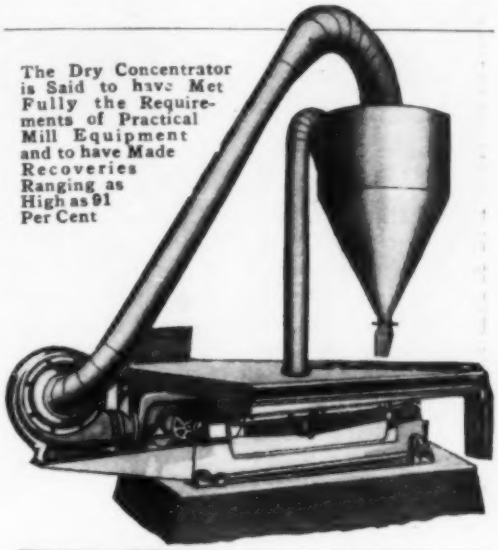
GARMENT GIVES COMFORT IN HOTTEST WEATHER

Perfect comfort while working in the hottest sunshine is the aim sought in designing a new loose-fitting one-piece garment. It consists of overalls and jumper combined and is worn without any other garments between it and the skin. While the wearer is at work it acts as a bellows, causing the air within to circulate, and by aiding evaporation keeps the skin cool.

Movement of the Body Causes Air within the Garment to Circulate

GLOWING CLAIMS ARE MADE FOR DRY CONCENTRATOR

Owing to the scarcity of water in certain western mining districts, dry concentration of ores is necessary.



The Dry Concentrator is Said to have Met Fully the Requirements of Practical Mill Equipment and to have Made Recoveries Ranging as High as 91 Per Cent

BY COURTESY OF MINING AND SCIENTIFIC PRESS

Importance is therefore attached to the recent development of an apparatus that is said not only to have shown great efficiency in separation and concentration, but also to have proved thoroughly satisfactory as mill equipment. In the latter rôle concentrators of this sort have heretofore failed because of the great quantities of dust discharged into the air. With the new apparatus an air system is employed which eliminates this difficulty. The new machines are now treating lead-zinc, lead-silver, tungsten, antimony, copper, tin, and gold ores, it is announced, with remarkable success. Recoveries ranging as high as 91 per cent have been reported.

¶To effect economical operation of transportation lines, factories and business houses in England are being urged to "stagger" their times of opening and closing and thus obviate congestion during rush hours. Adjacent establishments would begin and stop work successively instead of simultaneously.

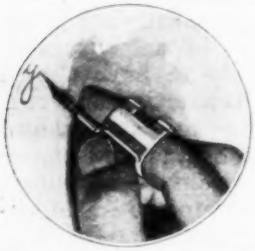
MIXER PREVENTS WASTE OF FUEL BY MOTOR

The purpose of a recently patented screen which is installed at a joint in the intake of a gasoline engine, between the carburetor and the cylinders, is to thoroughly atomize the fuel, thus promoting complete combustion and preventing the accumulation of carbon in the cylinders. The screen is of wire mesh, fine enough to break up any small drops of liquid that remain in the fuel, but will not retard its flow.

This Screen is Designed to Break Up Any Small Drops of Fuel There may Be in the Gas, Thus Promoting Complete Combustion

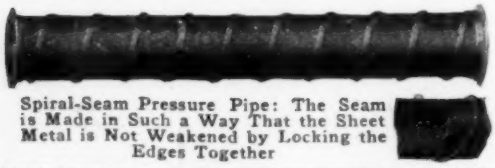
HOLDERLESS PEN ATTACHES TO FOREFINGER

A holderless pen is a new foreign invention which is said to make writing easier than with a penholder. It consists of a metal blank with a pen at the end, and having four clamps that fit the forefinger.



SPIRAL-SEAM STEEL PIPE MADE BY NEW MACHINE

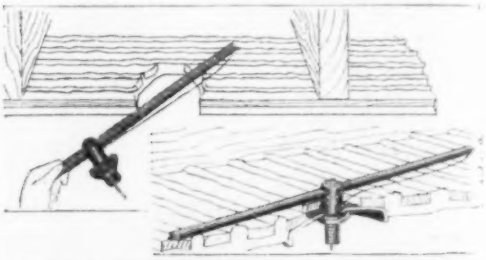
A machine has recently been brought out which manufactures pressure pipe with a spiral lock seam from heavy sheet metal. The seam is made in such a way that the strength of the steel is not destroyed by pressure or friction in locking the two edges together. Steel strips as thick as 1/8 in. are used in this process, producing pipe which, it is asserted, is equal to ordinary pipe the wall of which is 3/16 in. thick. Hot-rolled strips can be used to advantage in making pipe, thereby reducing the cost of manufacture by lessening the number of weldings required in a given length. If cold-rolled strips are used, the weldings are more frequent because the strips come in shorter lengths.



Spiral-Seam Pressure Pipe: The Seam is Made in Such a Way That the Sheet Metal is Not Weakened by Locking the Edges Together

SPECIAL CEILING-FIXTURE HANGER FOR OLD HOUSES

To facilitate the work of suspending lighting fixtures from the ceilings, when old houses are being wired, a special hanger has been developed. It consists of a bar on which there is an adjustable fixture stud. The latter is slipped to one end to permit the device to be inserted through a hole cut in the ceiling. When it is in a horizontal position it is drawn into place and the stud centered by pulling a wire leader. The bar extends across a number of laths and thus distributes the load evenly.



A Hole Barely Large Enough to Pass the Fixture Stud Is All That Is Necessary, as Illustrated Above. The Lower Drawing Shows the Device in Place

THREE NATIONAL FORESTS ESTABLISHED IN EAST

By a recent proclamation the president has established three new national forests, an act which makes sure the preservation of extensive and beautiful recreation areas for future generations. Of the three, the largest is the White Mountain Forest, of 391,000 acres, in Maine and New Hampshire. The others are the Shenandoah, of 165

acres, in Virginia and West Virginia, and the Natural Bridge, of 99,000 acres, in Virginia. The last-named tract does not include the famous Natural Bridge, which is about four miles from the boundary. The title to all the land has not been acquired, but the areas have been approved for purchase.

HEATHER USED FOR STOCK FOOD IN GERMANY

A heather substitute for fodder is being used in Germany and Denmark, which, its producers claim, is destined to become a permanent article of food for stock. A mill has been established on a heath in the latter country which turns out 200 bags of the product daily. The heather is ground into a sort of flour and then mixed with blood obtained from slaughterhouses.

ATTACHMENT TO ARMCHAIR USED AS A TABLE

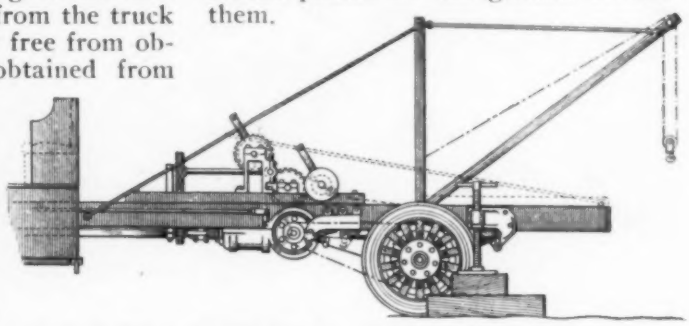
An armchair to which is attached an adjustable leaf that serves as a table top, is a recent household invention having many uses. The leaf is pivoted to a groove extending longitudinally in the top of the right arm and can be placed at a comfortable distance from the occupant of the chair. Being divided into two sections, hinged together, the attachment can be adjusted

An Armchair with an Adjustable Leaf Which Serves as a Book Rest or a Table for Games or Refreshments

to serve as a book or magazine rest, and when laid flat it serves equally well as a lunch or game table. When not in use it can be swung out of the way and folded down against the side of the chair. For an aged person, an invalid, or a convalescent person, the chair is especially convenient.

HEAVY-DUTY HOIST OUTFIT BUILT FOR MOTOR TRUCK

Those who employ hoisting equipment in connection with motor trucks will be interested in a new combination of the sort. The mechanism is mounted on a supporting frame that may easily be removed from the truck frame, leaving the latter free from obstructions. Power is obtained from the truck motor and transmitted by a shaft disposed at right angles to the turning axle of the drums. Side-bracing arms, with jacks at their outer ends, are provided just behind the rear wheels, to prevent lateral twisting and tilting when the hoisting mechanism is in use. They are arranged so that they may be swung out from the truck and the jacks turned down to rest on blocks placed on the ground beneath them.



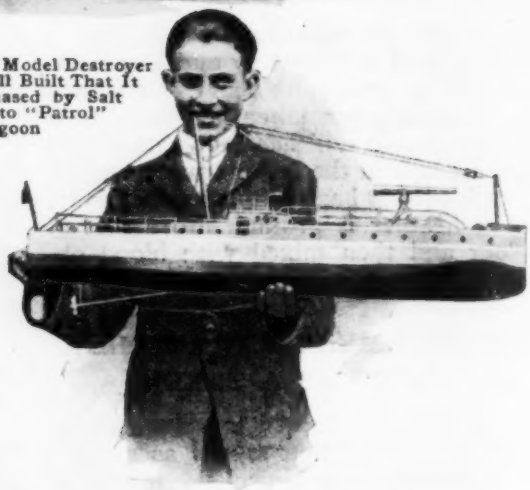
When the Hoisting Mechanism Is in Use, Lateral Twisting is Prevented by Side-Bracing Arms Fitted with Jacks Which Bear against Blocks Placed on the Ground beneath Them

HOW WAR INFLUENCES JUVENILE ACTIVITIES

The Washington Boy Who Made This Collection of Native-Wood Specimens Won Honors at County and State Fairs and Attracted the Attention of Government Timber Experts

While This All-Wood Aeroplane is Not Guaranteed to Break the Altitude Record, It will Travel Right Well When Propelled by a Pair of Sturdy Little Legs

This Boy's Model Destroyer was So Well Built That It was Purchased by Salt Lake City to "Patrol" a Park Lagoon



These Girls, at Brighton, England, Make Constructive Use of Their Woodworking Talents by Building and Selling Furniture and Other Articles and Donating the Receipts toward the Support of a "School Bed" in a Local Hospital Intended for Women

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AND PUTS ITS BRAND ON TOYLAND PRODUCTS

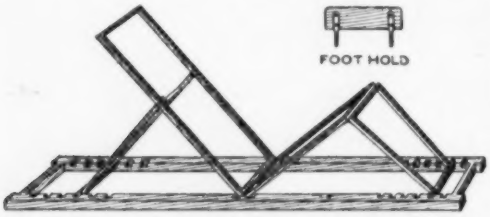
For Little Tots, Who Almost Lost the Use of Municipal Playgrounds in an Ohio City, This Shallow Bathing Pool was Provided at a Local Resort

Here Is an Honest-to-Goodness Cannon for the Training of Artillerymen of the Class of 1931. Wooden Projectiles are Shot 30 or More Feet

Many Young Women Are Puzzling, but Not in the Same Sense as These Girl Scouts Who are Making Puzzles by the Hundred for Soldiers at Various Training Camps. Pictures are Mounted on Thin Boards and Cut into Small, Irregular Pieces. The Puzzle is to Assemble Them Properly

ADJUSTABLE COTS FOR MEN WOUNDED IN ABDOMEN

Canvas-covered frames, which enable the occupants to rest in a semi-



An Adjustable Cot Which Permits the Occupant to Lie in a Semirecumbent Position, a Posture Often Very Desirable for Those Wounded in the Abdomen

recumbent position, have been built for soldiers having abdominal wounds. Each frame is made in three hinged sections and can be laid flat on its rectangular base when desired. To relieve the patient, the sections can easily be adjusted to raise the upper part of his body and his knees.

CELLULAR DEFLECTOR BUILT FOR MOTOR-CAR LAMPS

For motor-car lamps an all-metal deflector of odd character and apparent merit has been introduced to enable drivers to comply with laws governing vehicle lights.

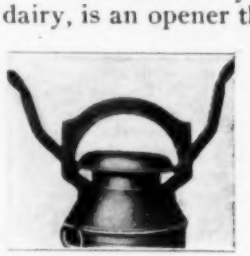
The device is semicircular in shape, of cellular construction, and designed to fit across the upper half of a lens. It possesses some 9,000 reflecting surfaces. Direct rays flood the road immediately in front of the car, while the deflected rays, the ones that normally produce the objectionable glare, are directed downward to illuminate the part of the road between the fields covered by the direct rays and the projected ones cast far ahead. It is claimed that no ray is projected above a height of three and a half feet.

GLASS COLOR ROD FOR USE IN COLORING BUTTER

A hollow-glass color rod, about the size of a pencil, is a new device to be used as a standard in coloring lots of butter a uniform hue. It is closed at both ends and contains a paper filling printed with special inks in four standard shades of yellow. It is claimed to be superior to color cards because not affected by grease or sunlight.

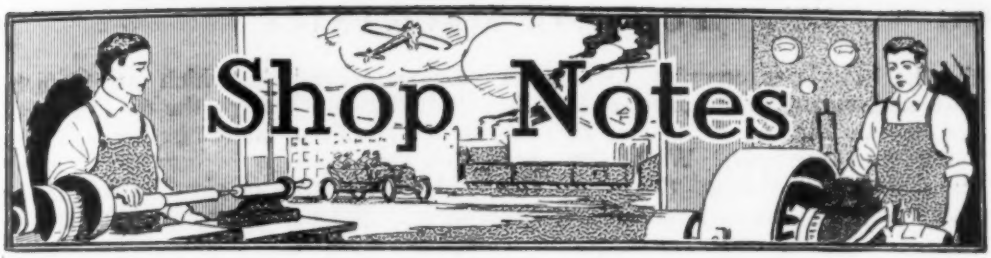
OPENER FOR MILK CANS IS NEW DAIRY ACCESSORY

A new accessory for the farm, or dairy, is an opener that will pry off the cover of a large milk can, even if tight-fitting, without denting or otherwise injuring the container. It consists of an arched member, to either end of which is pivoted a lever with handles pointing outward. By pressing downward on the handles, after the device is in position, the cover is easily lifted from the can.



SKULLCAPS OF THIN PAPER FOR HAT BUYERS

It is claimed that a customer trying on a hat previously tried on by a person having a skin or scalp disease, is exposing himself to infection. As a sanitary precaution it is proposed to supply each prospective hat buyer with an inexpensive skullcap of thin paper to be worn while he is endeavoring to find a hat that fits.

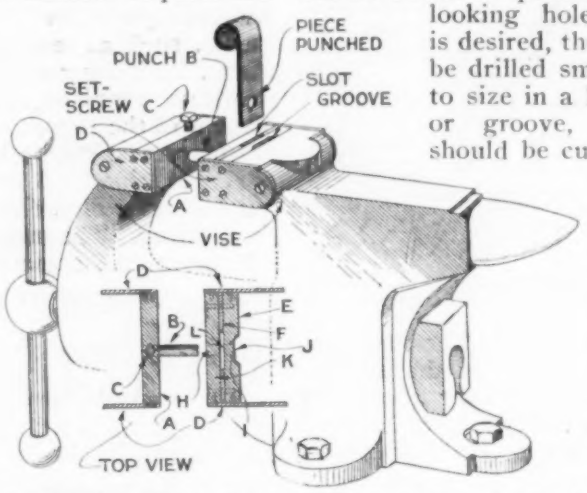


Making a Punch-and-Die Attachment for a Bench Vise

By L. A. CROZIER

AN ordinary bench vise may often do the work of a punch press costing several hundred dollars, if rigged up as shown in the illustration. Of course, the speed of operation will be much slower, and it will be difficult to secure any great accuracy, but these are often not of much importance when only a small number of parts are to be made — say from 20 up to 1,000.

The method of construction described here can, of course, be varied to suit different conditions; the size of hole that can be punched depends on the size of the vise, and on the thickness and hardness of the material. In the case here described, a ⅜-in. hole was to be punched in a number of phosphor-bronze lugs. A punch, B, made of ⅜-in. drill rod, hardened at the cutting end, was fitted into a piece of ½-in. flat, mild steel, A, shaped to cover the movable jaw, and a setscrew, C, was placed so as to keep it from working loose. The soft end of the punch should seat firmly against the vise jaw. The punch holder A was made fast to the vise jaw by two thin pieces, D, with small machine screws. This completes the punch, or moving member. The fixed member, or die, is similarly fastened to the stationary jaw of the vise. It consists of the die block E, the stripper K, the plate F, and the two thin pieces D, fastened together with screws as shown. The die block should be made of tool steel, at least ½ in. thick, and should be drilled out the size of the punch; or if a cleaner-looking hole in the work is desired, the die block may be drilled small and reamed to size in a lathe. A notch or groove, shown at J, should be cut, large enough to permit the punching to drop out. The hole in the die block should be enlarged slightly, up to about ¼ in. from the cutting surface L, as indicated at H; this may be done with a larger drill or with a taper reamer.



By Mounting a Simple Punch and Die in the Jaws of a Bench Vise, It may be Made to Do the Work of a Punch Press

The stripper for such a die should be made quite thick, this one being made of the same thickness as the punch holder; it should be drilled and countersunk as shown, or reamed with a taper reamer, depending on the amount of "wobble" in the vise, so as to guide the punch accurately into the die and prevent shearing the punch.

The plate F is a little thicker than the work to be punched, and is shaped so as to locate it properly.

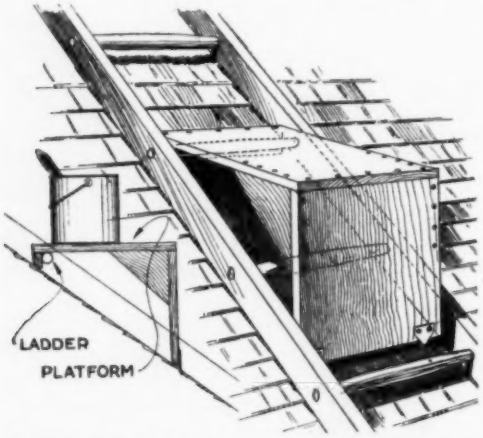
A good way to match the punch with

the die hole is to complete the punch first, and assemble the parts of the die before the hole is drilled in the die block and stripper. With the two members mounted in the vise, the punch can be screwed up against the stripper and a mark scribed around it to locate the hole, which may then be drilled clear through the die. The die block should of course be hardened before use.

Various types of simple dies for use in vise jaws will suggest themselves when required.

Convenient Ladder Bucket Jack for Roof Workers

An ingenious painter has built this jack or shelf to hold his paint bucket



A Bucket Jack for Roof Painting, Which can be Quickly Moved as the Work Progresses

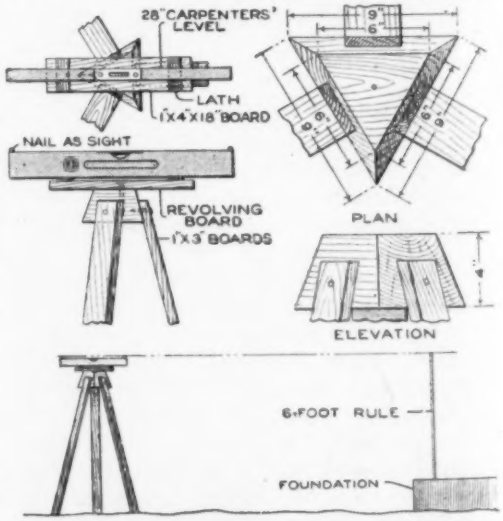
while at work on a roof. The construction is shown clearly in the sketch. The upper end hangs over a rung of the ladder, while the lower end has two steel plates with sharp points which take hold in the shingles; the points may be left off if the corner braces are firmly fastened with screws. The rack can be moved from one rung to another in a second or two.—T. B. Paul, Dermott, Ark.

Burrs inside Tubing and Castings Removed by File in Chuck

Tubing and metal castings having an inside surface frequently require burring. The burrs on the inside surface, caused by drilling holes from the outside or from milling operations, are often difficult to remove by hand. In the burring department of a large factory it is the practice to insert a rat-tail file in the chuck of a lathe. This permits the revolving of the file at high speed, and if the product to be burred is held so that the file operates against the inside surface, the burr is quickly and neatly removed.

Surveyor's Tripod Level Made Quickly from Carpenter's Level

A good substitute for an architect's or surveyor's level for general purposes, such as leveling house foundations, building roadways, and similar work not requiring minute accuracy, is shown in the sketch. It consists of an ordinary carpenter's level placed upon a simple tripod. A small finishing nail on each end of the level is convenient in sighting. The method of leveling is, of course, the same as that employed



Sufficiently Accurate Results for Ordinary Work may be Obtained Up to a Distance of 500 Feet on a Clear Day with This Homemade Level

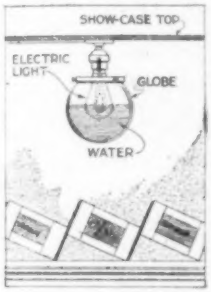
when using the surveyor's level.—Roy H. Poston, Flat River, Mo.

A Simple Depth Gauge for Blind Holes in Wood

When a number of holes are to be drilled in wood, of the same depth, and no collar is handy to make into a depth gauge, a cork may be used. A hole is drilled through it somewhat smaller than the drill, and it is forced on. It has been found that as many as 100 holes can be drilled to an accurate depth without readjusting the cork.—H. S. Hart, Shreveport, La.

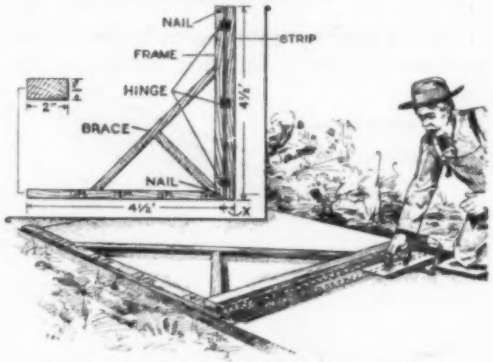
An Electric Cigar-Case Humidifier

A proper degree of humidity may be maintained in a cigar-display case and the case illuminated, at the same time, by arranging an incandescent lamp so that its lower end dips in water contained in a glass fixture bowl. The globe is supported from the lamp socket by an ordinary shade holder. When the lamp is lighted, the heat developed vaporizes the water, which keeps the cigars moist.



Folding Square for Dividing Concrete Sidewalks

The sketch shows a square for rapidly cutting cement sidewalks into blocks, 4 ft. long, or any other dimension. It is designed as an improvement on the method of pencil marks made on the forms, which are obscured by the concrete and are seen with difficulty. The frame may be made of 1 by 2-in. material and each arm should be about 4½ ft. long. Drive nails through as indicated, projecting about ¼ in. to prevent slipping of the square. The strip at the right swings on hinges. The distance X should be the same as the distance from one edge to the center of the sidewalk center tool, which varies from 1¼ to 1 7/16 in. As soon as the block is cut at the edge of the strip, the strip is turned back, and the sidewalk center tool run across the

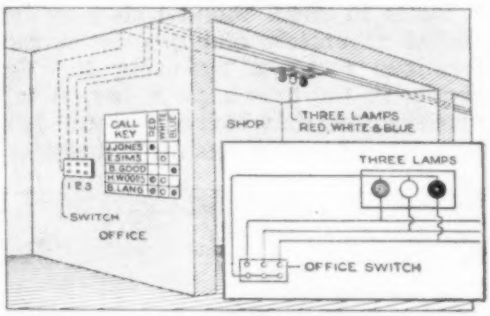


The Folding Square Divides Cement Sidewalks into Even Squares That Are Accurate

block, keeping one edge of the tool against the frame. The square has been found to be convenient and rapid.—J. W. Muncey, Jesup, Iowa.

Colored-Light Electrical Shop-Call System

A visual call system for an office, shop, store, or other institution, which will make it unnecessary to send a messenger about the plant to locate an individual who is wanted in the office, can be arranged as indicated in the illustration. Where such a system is used, a combination of lights can be assigned as a signal to each person who is frequently called. The switches operate similar lights in every department, so that wherever the man called

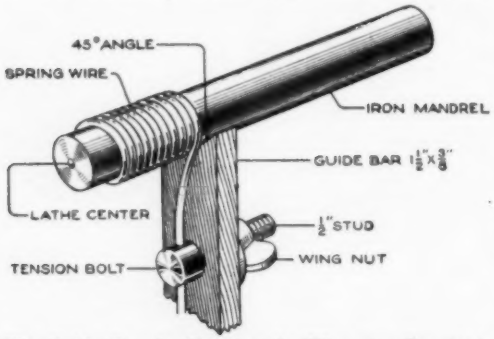


Schematic Representation, with Wiring Diagram, of a Colored-Light Electric Shop-Call System

happens to be, he will see his signal, and will call the office on the nearest telephone.

Device for Winding Spiral Springs on a Lathe

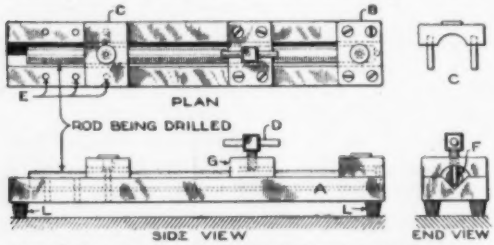
Spiral springs may be quickly wound on an ordinary lathe with the aid of the simple device illustrated. The spring wire is wound on the mandrel, which should preferably be set between the centers of a lathe. The wire is fed through a tension bolt held in a guide bar, which is supported and fed longitudinally along the mandrel in the tool post of the lathe, as the mandrel is rotated. When winding a closed coil spring, it is unnecessary to set the guide bar in the tool post, inasmuch as it can be fed along by hand with good results.—J. J. Booth, St. Louis, Missouri.



The Guide Bar, by Holding the Wire at a Constant Tension, Insures the Uniformity of the Spring. For Open Springs, the Feed Is from the Lead Screw

A Jig for Holding a Round Rod to be Drilled

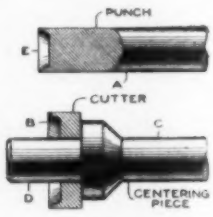
Holes in small round rods may be drilled accurately and quickly at the locations required by using the jig shown in the drawing. A bar, A, of machine steel, in which a V-groove has been planed, constitutes the body. One block, B, equipped with a drill-hole bushing may be attached with screws at the location where one hole is to be drilled. Another block, C, also equipped with a drill-hole bushing, is adjustable. Guide pins on its under face engage in the holes E in the bar. These holes are so located that the holes in the rods will be drilled where required. The block G is fastened with screws. It is drilled and tapped for a setscrew, D, which clamps the rod tightly, thus preventing it from turning. The stop pin F locates the rod accurately in the groove. Lugs, L, attached to the bottom of the bar, permit the fingers to pass under it so that it can be adjusted readily on the table of the drill press.—E. S. Goodell, Chicago, Ill.



With This Jig Small Round Rods can be Drilled Quickly and Accurately. It is Easily Adjusted on the Table of a Drill Press

Tool for Cutting Thin Brass Washers

A number of washers were formed from sheet-brass stock, .005 in. thick, with the tools detailed in the accompanying drawing. The number of washers required was not sufficient to justify the expense of a punch and die for use in a press. Hence, the tools were designed so that the cutting could be done with a hand-hammer blow. Tool-steel stock of a diameter equal to that of the hole to be punched in the washer was used for the punch A. It was cupped at the bottom, as indicated at E, thus providing a cutting edge. The cutter B was also made of tool steel turned with an outside diameter equal to that of the washer, and cupped as shown. The working ends of both the punch and the cutter were tempered to cut brass. A centering piece, C, was turned from machine steel. Its lower end, D, was made of the same diameter as that of the punch, so that it formed a pilot pin centering the cutter over the hole previously cut in the washer blank. A



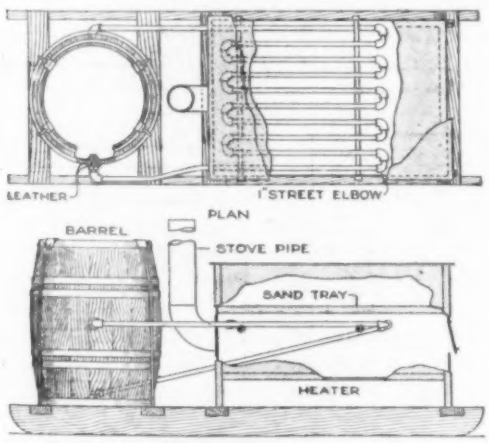
shoulder turned on the centering piece holds the cutter in correct relation. Washers formed with this tool become concave. Hence, to flatten them, each was laid between two iron blocks and the upper one was given a sharp rap with a heavy hammer.

Cleaning a Clock Quickly and Thoroughly

Clocks that need no repairs may often be cleaned without taking the works apart. Remove the works from the case, and take out the verge and flies. Then, with the wheels in rapid motion, pour naphtha or gasoline over the works, or immerse them in a dish of gasoline. Finish by wiping dry with a linen rag, and oiling with best clock oil. This method is especially good for clocks that have been treated with kerosene, as the gasoline quickly removes the gummy kerosene residue, which has often accumulated to a surprising degree.—William C. Strong, Natick, Mass.

Portable Water-Heater Outfit Made from a Barrel

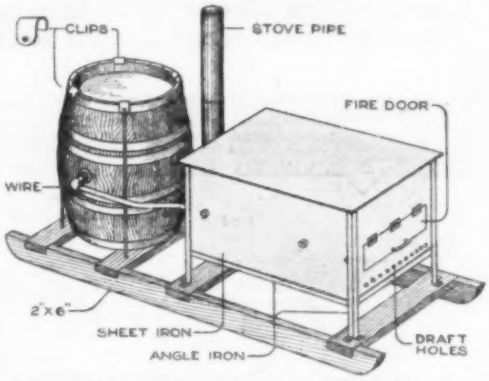
This device warms gravel and sand as well as water, for winter construction work, with one fire. The use of



Plan and Side Elevation of Heater, Showing Details of Water Circulation

standard parts and material makes the heater easy to construct. The sketches indicate the construction and assembly details. Stout skids give the heater a firm base and make moving easy.

The water-heating coil is made of



General View of Complete Heater Ready for Use: It will Burn Any Refuse Wood as Fuel

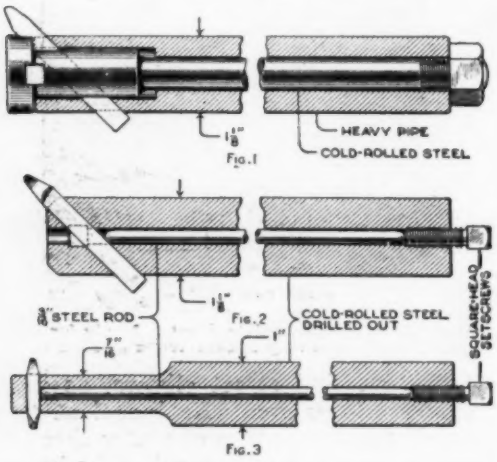
1-in. pipe and street elbows, as indicated. By tapping the barrel at two levels the circulation of water through the heating coil is assured. The barrel is held firmly in place by means of clips over the rim, fastened by heavy wire or light rods passing through the skid crosspieces. The coils are held over the fire by two pieces of pipe, crossing the fire and supported by the sides of the heater.

Easy Method of Removing a Boiler Flue

When removing a defective flue from a boiler, it is often necessary to transfer it; that is, it must be taken out through a flue hole other than its own, being prevented by some obstruction from being taken out through the latter. To accomplish this, after removing the flue occupying the hole through which the defective one is to be removed, the defective flue is pulled out through its own hole about a foot, and the extending portion is cut off with a pipe cutter or hacksaw. The remaining length is then pushed back into the boiler, and can easily be shifted over so as to be pulled out of the hole desired. If other flues intervene, they should first be removed by the same process.—W. H. Thomas, Davenport, Iowa.

Methods of Holding Tools in Lathe Boring Bars

There are many styles of boring bars in use, but those shown in the illustration offer the advantage that the tools



The Tool is Clamped in the Bar So That No Screw or Sleeve can Get in the Way

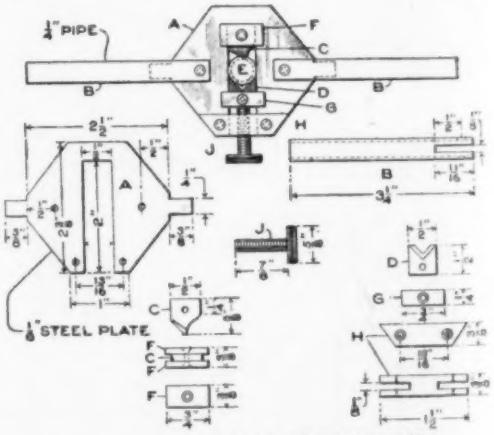
are firmly held by a screw, or nut, which is far from the work and cannot get in the way. Figs. 1 and 2 show types which are suitable for boring out holes 1¼ in. in diameter, or over, while Fig. 3 shows a bar for smaller diameters. In the first two, holes are provided for holding the tool at either 45° or 90°; other angles may be used if desired. The bar shown in Fig. 2 may readily be made double-ended, holes being then drilled for tools in both ends; that shown in Fig. 1, however, clamps the tools with somewhat greater force. The bars are best held in a rigid holder built onto the tool post, but they may be readily adapted for swinging between centers if desired.—M. L. Lowrey, Livermore, Calif.

Handy Chemical for Use about the Automobile

Carbon tetrachloride, a colorless, volatile chemical, is handy for use about the automobile. As a liquid fire extinguisher, it has no peer. Used as a solvent for unvulcanized rubber, it makes an excellent cement for inner tubes. It dries quickly, has no disagreeable odor, and is not inflammable. It can also be used to make cement for repairing mohair tops, and is an excellent solvent for removing grease and oil from clothing, leaving no "ring" around the cleaned spot. For marred mud guards, make a solution of Egyptian asphaltum, or gilsonite, in the carbon tetrachloride and apply with a brush.—Leon A. Haloin, Denver, Colo.

A Serviceable Tool for Cleaning Threads on Bolts

The tool here illustrated, which looks like a tap wrench and works somewhat like a die, can be made entirely on the bench. The construction is evident from the drawing. The cutter C should be kept fairly sharp; it should, of course, be ground to a 60° "V," to fit the thread. The V-block D should also be beveled down to fit the thread; its edges should not be exactly opposite the cutter point, but offset about half the pitch of the average thread; for instance, if most of the bolts to be cleaned are from 12 to 20 pitch, the beveled edge of D should be set back 1/32 in., so that a 16-pitch bolt will be held exactly at right angles to the plate A. Bolts up to ½ in. in diameter can be cleaned up, and any



DETAIL OF TOOL PARTS

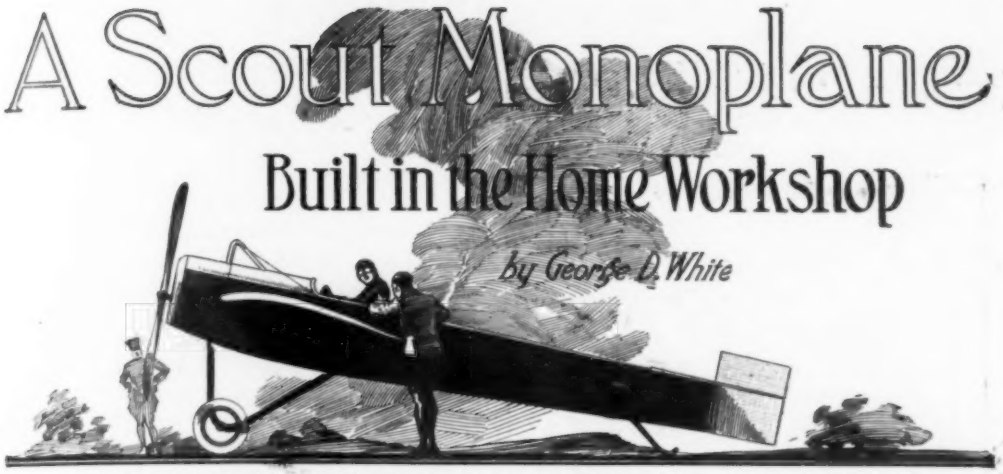
The Thread Cleaner Is Adjustable So That It can be Used for Various Sizes of Bolts

small defects in the thread cleared out.—C. Ray Haynes, Center Village, N.Y.

A Scout Monoplane

Built in the Home Workshop

by George D. White



THIS is the last of four articles on the subject of airplane building that Popular Mechanics Magazine has published. The preceding installments, which appeared in the May, June, and July issues, described wing construction, landing gear, and fuselage. This chapter describes the final stages of development, with the view of making it possible for men and boys, or groups of boys, of average mechanical ability, to construct a successful airplane.—Editor.

PART IV—Controls, Power Plant, and Assembly

AFTER the wings and other planes have been attached, the next step is to connect up the controls. The control system applied is that invented by the French aeroplane constructor Deperdussin, and is familiarly known throughout the world of aeronautics as the "Dep." It has been adopted as standard by the U. S. government for military and training planes.

This system consists of a steering wheel located on a column, and a foot bar, both pivoted, as shown in Fig. 14. To turn the plane sidewise, the pilot pushes the bar with his foot on the side toward which he desires to turn, that is, to turn to the right he pushes with his right foot, and to turn to the left, with his left foot. The pivoted steering column is used to make the plane take an upward or downward angle in flight. To rise, the pilot moves the wheel toward, and to descend, away from himself, thus operating the elevators. To balance the machine laterally, the steering wheel is turned. If, for example, a gust of wind tilts the right wing up, the wheel is turned to the right. This raises the right aileron, lowers the left aileron, and rights the machine. In other words, to balance the monoplane sidewise, turn the wheel toward the high side.

As shown in Part I, the ailerons are hinged to the main wings with flat steel hinges, about 2 in. wide. Three hinges are used for each aileron, of which two are placed 3 in. from either end, and the third 1 in. off the center, of the aileron. The third hinge cannot be placed exactly in the center, because a control pylon must be located there. The elevators are hinged to the stabilizer in the same manner, each with three hinges.

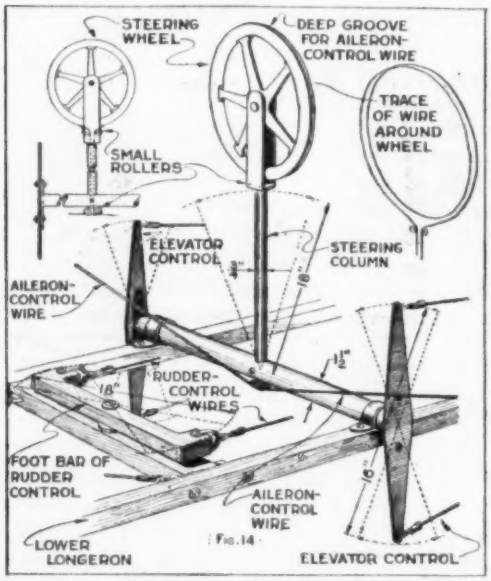
Control Pylons

Ten control pylons, 6 in. long, are required, two for each of the ailerons and elevators, and two for the rudder. As shown in Fig. 15, they are made of ½-in. steel tubing with the ends flattened out. The top ends are drilled, as shown, with two holes, one 3/16-in. and the other ⅛-in. In the bottom ends, which are bent as shown, a 3/16-in. hole is drilled. The pylons are mounted in pairs on the top and bottom of the ailerons and on the elevators, and are bolted together through the center of the front beams of the respective planes. The rudder pylons are bolted together horizontally through the rudder post.

Aileron Controls

Between the tops of the upper pylons, one control wire is strung, as follows: It is first attached to the 3/16-in. hole in the pylon on the right-wing aileron, then taken through a pulley block

bolted to the center beam, along the wings, through another block on the left-wing beam, and to the 3/16-in. hole in the left-aileron pylon. A turnbuckle



In the "Dep" System of Control the Pilot Guides the Machine by Means of a Wheel and a Foot Bar. The Ailerons are Controlled by Revolving the Wheel, the Elevator by Moving It Backward and Forward, and the Rudder by Moving the Foot Bar

is provided in this wire, to tighten it properly. The center beam should be strengthened where the pulley block is bolted to it, by having four short pieces nailed in on either side of it, extending, from the rib where the pulley is attached, to the adjacent rib on either side. In order to operate the ailerons from the cockpit with the steering wheel, a cable is run from the 3/16-in. hole in the top of the under pylon on the right-wing aileron, through a block bolted to the center of the wing, through the side of the fuselage in line with the hollow steering column, around a pulley at the bottom of the latter, up through it and around the steering wheel, then down and out in a similar manner, to the pylon of the left-wing aileron. This is shown in Fig. 16 and detailed in Fig. 14. The two control wires now described should be so applied that when both are taut, the trailing edges of the ailerons are in line with the trailing edges of the main wings, or in other words, when the ailerons are in a neutral position. Wherever it is necessary to pass a wire through the fuselage, a square piece of fairly heavy leather, in which two diagonal slits are first cut, is sewed to the fuselage covering, the wire being taken through this piece of leather. Thus, the wire moves freely without chafing while the fuselage is entirely covered.

From the 1/8-in. hole in the top of each aileron pylon, three guy wires are run to the trailing edges of the ailerons, as shown in Fig. 16, to brace the pylon when the control wires are tightened. The fitting used for attaching the guy wires to the edge is shown in Fig. 15. With this arrangement of the wires, it is evident that when the steering wheel is turned to the right, the aileron on the left wing is lowered, the right aileron raised, and the right wing is forced down, since, by this operation, more air pressure is applied under the left wing and on top of the right.

It is cheaper to buy the steering wheel and column complete with all pulleys from a supply dealer than to make them, so no other description of these parts is given.

Rudder Controls

The rudder is operated with a foot bar which is located on the floor of the fuselage a convenient distance in front of the pilot's seat. The bar is made from any hard wood, such as ash, hickory, or birch, 18 in. long, as in Fig. 14. A 1/4-in. hole is drilled in the center, through which it is pivotally bolted to a bottom cross strut, as shown in Fig. 14. From the top of the pylons, fastened to the rudder post as previously described, to the trailing edge beam of the rudder, two guy wires are run as with the ailerons, one wire being horizontal and one leading to the lower corner of the rudder, as shown in Fig. 16. The control wires are run from the 3/16-in. holes in the pylons, from the right and left pylons to the corresponding ends of the foot bar, a turnbuckle being put into each wire. Thus, when pushing on the bar with the right or

left foot, the rudder swings to the right or left, respectively, and the machine turns in the corresponding direction.

Elevator Controls

The steering column, to which the steering wheel is attached, is ¾ in. in diameter and is hollow. Obtain a piece of steel tube, 1½ in. in diameter and 36 in. long. In the center drill a ¾-in. hole and insert the bottom of the steering column. Let the steering column project through about ½ in. and bolt it fast through both tubes with a ¼-in. bolt, as shown in Fig. 14. Next make two strap bearings from sheet steel about .050 in. thick. Bolt these fittings, one on either side of the fuselage, to the top of the lower longerons, with 3/16-in. bolts. The 1½-in. tube through which the control column is inserted is put through these fittings, the ends of the tube projecting beyond either side of the fuselage for a few inches. Thus, the 1½-in. tube pivots in these fittings so the entire wheel and steering column can be pulled back and forth, pivoting at the bottom. The projecting ends of the 1½-in. tube are split, flattened, and bent, as shown, to provide fastenings, to which are bolted, at either end of the tube, steel straps, ⅛ in. thick and 16 in. long, 2 in. wide in the center, tapering to 1 in. on the ends, and drilled with 3/16-in. holes at the latter. One-fourth-inch bolts are used for this purpose.

As in the case of the ailerons, three guy wires are strung from each ⅛-in. hole in the elevator pylons to the rear edge of the elevators. The control wires run from the 3/16-in. holes in the pylons to the steel straps on the ends of the tube, just described, but, for reasons that will be evident later, they cross, as indicated in Fig. 16. When the flier wishes to climb, he pulls the steering-wheel column toward himself, as stated in the general description of the control system. This movement results in the straps on the ends of the tube upon which the steering column pivots, describing arcs of a circle, the tops backward and bottoms forward, thus raising the elevators. Pushing the column away, of course, reverses the action, lowering the elevators and causing the plane to take a downward path.

Mounting the Motor

It now remains to install the power plant and its accessories. The motor

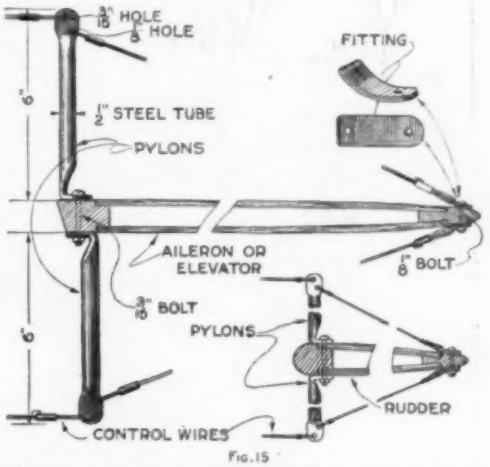


FIG. 15

The Control Wires are Fastened to the Beams by Means of Steel Straps, and Each Wire has a Turnbuckle in Order to Secure the Proper Tension

should preferably be of 35 hp., but motors of from 30 to 80 hp. will also be suitable. One of 30 hp. will fly the machine very nicely and by using a larger motor more speed can be obtained. The 35-hp. motor will give the machine a speed of 70 miles an hour, which is fair for this type of machine and all the beginner should attempt to handle. The motor may be of a 3, 4, 6, or 8-cyl. type. With the 35-hp. motor, the propeller, which is furnished with it, will be 7½ ft. in diameter and have a pitch of about 4½ ft. Having procured the engine, measure the distance between the bolt holes and arrange the motor bed accordingly, as described in Part III. Either a water-cooled or an air-cooled motor may be used. The latter is simpler but not so reliable. If a water-cooled engine is selected, the radiator should be mounted squarely in front of the fuselage, all the additional fittings for its support being two brackets, bolted to the front of the fuselage, about 4 in. high and the thickness of the radiator, the bot-

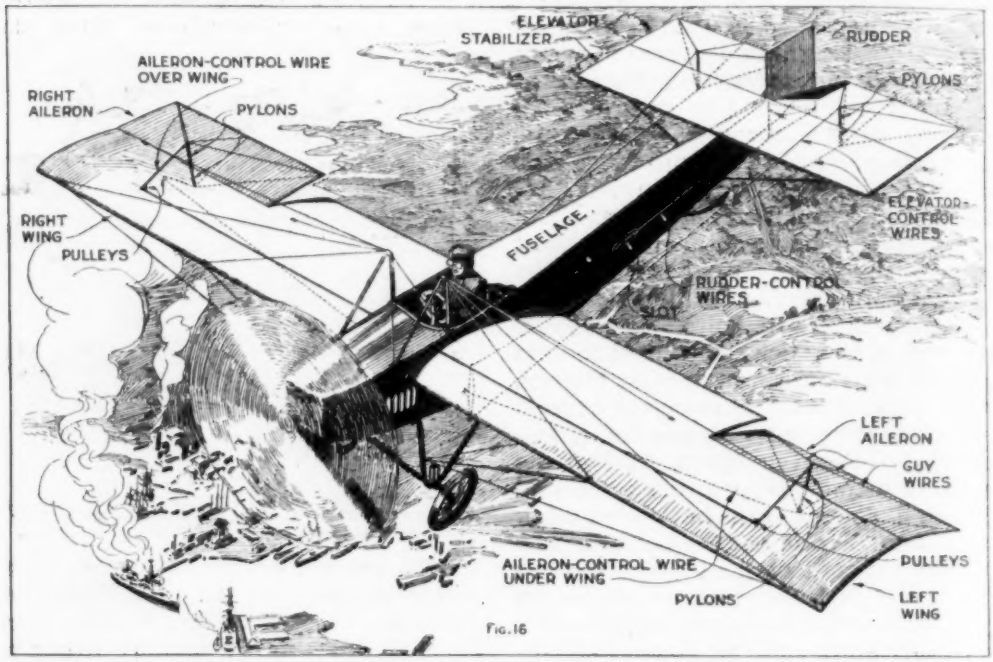
tom arm of the bracket being bent up at the end so as to hold the radiator securely.

Fuel Tanks

Have a galvanized iron tank made with several baffle plates, or short crosswise partitions, to prevent the fuel from splashing suddenly from one end to the other. Fuel for four or five hours' flight can be carried in a rectangular tank, 30 in. long, 15 in. deep, and 10 in. wide. The tank is preferably made with two ears, or projections, at the top, so that the ears can rest on top of the upper longerons. Steel straps, bolted to and parallel with the longerons, pass over the top of the tank to hold it in position. The feed line can be taken from the bottom of the fuel tank to the carburetor of the motor. A flexible woven-metal hose should be used for this purpose, in preference to copper tubing, rubber hose, or similar material. The latter are not suitable and are extremely dangerous. By following the plan indicated it will be a simple matter to increase the fuel capacity at any time when longer flights are undertaken.

Motor Controls

The throttle regulating the gasoline supply may be taken to the cockpit with flexible control wire. A foot throttle is more suitable and will be found more convenient than a hand throttle. When connecting this throttle, use a small coil spring that will normally hold the throttle wide open, since, as a rule, the motor will be running at full speed, except in starting and landing, and there is no opportunity when flying to hold the throttle open. The spark control may be adjusted as desired.



How the Scout Monoplane will Look in Flight: The Location of the Control Wires is Shown; with the Ailerons in This Position the Pilot is Righting His Machine as a Gust of Wind Strikes under His Right Wing

Assembly of the Monoplane

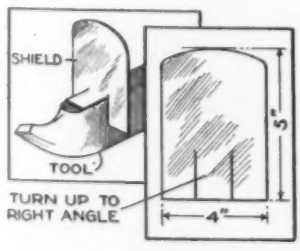
When the motor, tanks, and controls are all installed, the entire monoplane is finally assembled and inspected. Every wire should be tight, and every nut and bolt secure; the machine should be lined up straight, which can be ascertained with a square and level; and all the controls should

be manipulated while sitting in the pilot's seat to make sure that they work freely and are connected correctly. If all is found well, roll the machine out on a field, to give it a tryout. The field should have not less than a mile of straightaway stretch. A field one mile wide and three miles long is desirable. If there is any suspicion that it is too small, do not use it. It is far better to walk a few miles to a larger field than to take a chance of wrecking the monoplane.

Attempts at flying should be slow, if one has no previous experience; one should stay on the ground until he gets the "feel" of the machine and can keep it in a straight line for runs at full speed across the field and back. Don't try to get off the ground more than 10 or 15 ft. the first month. When straightaway flights are made easily, try turns, first making big, wide, shallow turns without banking perceptibly. Confidence and skill can only be acquired gradually by persistent and careful practice.

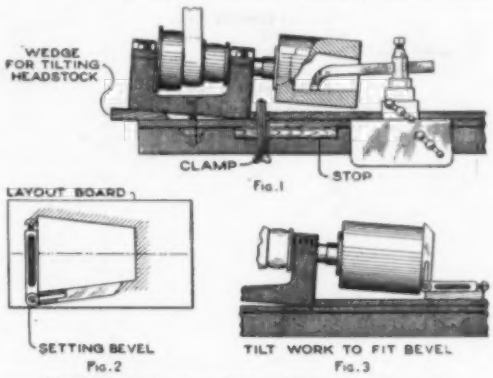
A Chip Protector on Lathe Cutting Tool

While turning cast-iron or brass castings on a lathe, the operator is constantly in danger of having flying chips lodge in his eyes. A simple yet suitable chip protector may be made to fit over the lathe cutting tool, thus providing greater safety to the operator. Cut with metal hand shears a piece of sheet iron 4 by 6 in. Round the corners of one end, as shown in the sketch. On the opposite end make two cuts into the sheet. The distance between these should be the same as the width of the tool, and the length of the slit about 1 in. Bend out the middle section between the slits until it is at right angles with the metal sheet. The protector thus formed may be slipped in place, a leg of the metal piece on each side of the tool.



Turning Tapered Core Boxes in a Metal Lathe

Ordinarily the turning of tapered holes in pattern core boxes, when the lathe to be used is not equipped with the universal tool carriage, is considered a hand-tool job. However, when hand tools are used the procedure is irksome and expensive. It is necessary to stop the lathe frequently to test the work with a template. Where the holes to be turned are too deep to receive the tool rest and tool, the work must be done at the bench. By utilizing the method outlined in Figs. 1, 2, and 3, an ordinary metal-turning lathe can be made to perform the operation accurately and economically. The only special tool needed is one which, when in position, has its cutting point in a line vertical to the center line of the lathe, as shown in Fig. 1. To obtain the taper cut, the headstock is tilted by clamping a wooden wedge under it. To insure the proper taper a bevel gauge is used, as in Fig. 2. Then the headstock is tilted, as in Fig. 3, until the face of the cylinder in which the hole is to be cut lines up with the angle indicated by the bevel gauge. Before the headstock is tilted it is advisable to turn out the hole to the proper depth and to the diameter of its small end, so as to minimize the work of tapering.



Method of Turning Taper Hole in a Core Box on an Ordinary Metal-Turning Lathe

Gear-Cutting Attachment for Lathe

Often emergencies happen which require the production of gears in

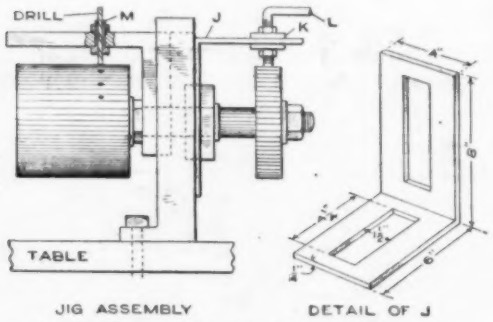


Fig. 1—Details and Assembly of Drilling Jig for Gear Cutter: A Screw-Cutting Gear from the Lathe Serves as an Index

shops not fitted out for that work. The illustrations show how the work was done in one shop, including the making of a drilling jig to divide the index wheel. Fig. 1 shows the drilling jig. The index wheel was an old pulley cut in half, shown in section at D, Fig. 2. It was of suffjcient width to accommodate several rows of index holes, and was mounted on a shaft, as shown. A screw-cutting gear from the lathe was used to divide the index wheel. In Fig. 1 is shown the drill, passing through the hardened bushing M. The index screw L was shaped to fit between two teeth of the screw-cutting gear. K is the lock for the index screw, and J the support for the indexing mechanism. The dividing holes in the index wheel are not drilled through. The point of the index screw must be true with the body of the screw, or otherwise the gears cut will not be true.

In Fig. 2 are shown the different parts of the gear-cutting device, a sectional view appearing in the lower right corner. The gear blank is mounted on the mandrel, the members of which are shown at E, F, G, and H. A, B, and C are parts of the frame of the gear-cutting attachment. The gear cutter was mounted on an arbor, swung between the lathe centers. The gear-cutting attachment was substituted for the tool post, and the cross feed used to feed the gear blank to the cutter. By raising or lowering the sleeve bearing C, any wheel within the capacity of the attachment can be cut accurately.—Denis Hanlon, Vincennes, Indiana.

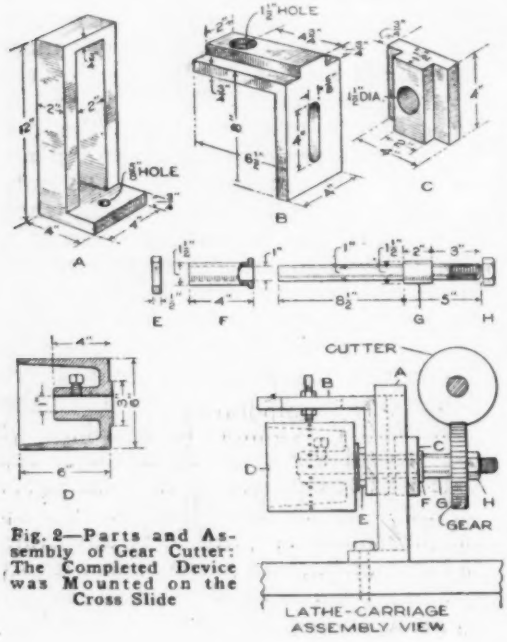


Fig. 2—Parts and Assembly of Gear Cutter: The Completed Device was Mounted on the Cross Slide

Old Files Used as a Substitute for Tool Steel

The present price of tool steel makes its use almost prohibitive, and even the best of it nowadays is frequently of poor quality. I find that I can make a very good boring tool by grinding it out of an old square file. Tools made from files are especially useful for work on bronze or brass, and on castings that are full of sand.—Robert M. Thomas, Cheyenne, Wyo.

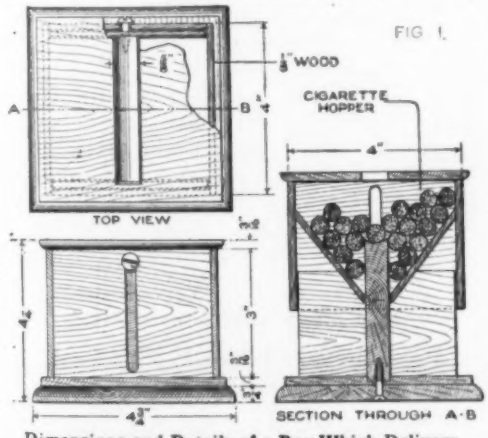
Homemade Putty for Reliable Results

A very good grade of putty may be made by mixing white lead, in finely powdered form, with varnish. Use enough of each to produce the proper consistency.—Howard D. Wildman, Schenectady, N. Y.

Cigarette Box Deals Out One at a Time

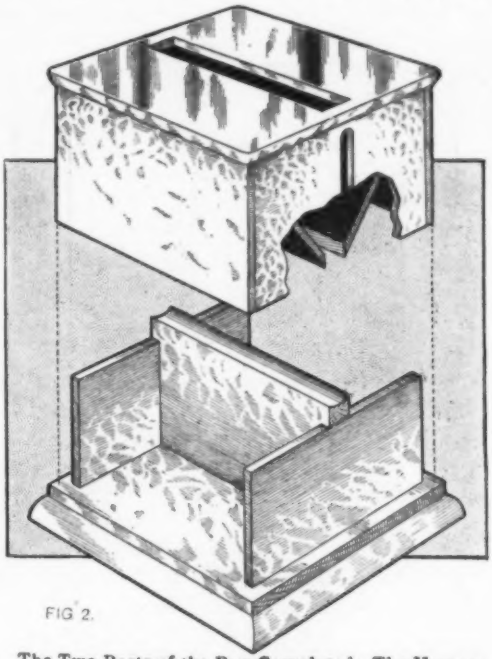
WHEN the cover or top is raised this cigarette box delivers one cigarette each time the process is repeated.

A wood base is fashioned of hard wood, in the manner shown in section in Fig. 1, 4½ in. square, to which is fastened an upright with a grooved top, large enough to hold a cigarette. The base is cut out ⅛ in. in depth to admit the upright, which is screwed fast from the bottom, as in the sectional view. Two sidepieces, of ⅛-in. material, are nailed to the sides of the upright to make it firm, and also to act as a slide for the cover, as shown in Fig. 2. The top, or outside box, is also made of ⅛-in. material. The sides are cut so as to fit loosely over the two sidepieces of the upright. In the top a slot is cut, ⅝ in. wide and the length of the top, to admit the upright. The sides and top of the cover together are $3\frac{3}{16}$ in. in height, so that the upright is flush with the top. Two pieces of ⅛-in. stuff are cut 3 in. wide and as long as the inside of the cover, and glued to it, as shown, forming a triangular hopper for the cigarettes. Sufficient space at either end is allowed for the cover to be let down over the lower part until it rests on the base. A small slot is also cut in each end of the cover,



Dimensions and Details of a Box Which Delivers One Cigarette Every Time the Cover is Raised and Lowered

as shown. The cover is then put into place, and a small round-head screw put into the upright on either side, through the slot at the top, to prevent



The Two Parts of the Box Completed: The Hopper under the Top Has Space for About 40 Cigarettes

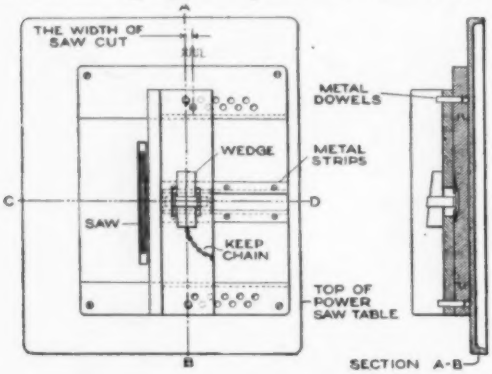
the top from coming off when it is raised. The box is then polished or shellacked, and a piece of felt glued to the underside of the base to prevent it from scratching. The filling is accomplished by raising the cover and putting the cigarettes into the hopper through the opening in the top. The box will contain about 40 cigarettes when filled. The sectional view in Fig. 1 clearly shows what happens when the cover is raised and lowered.

Filling Cracks in Concrete with Putty

To repair temporarily cracks in concrete work around brick flues on houses, where they project from the roof, putty has been used with good results. The putty for this work should be mixed until it is thoroughly elastic, but not thin, and then worked well into the crevices.—H. K. Capps, Stahl, Mo.

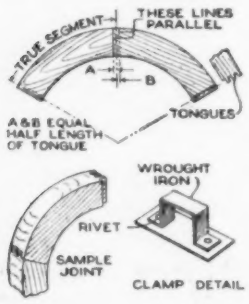
Segment-Joining Jig for the Home Workshop

In the accompanying diagrams are described graphically the construction



Tongue-and-Groove Joints can be Made Quite Rapidly in Patterns, by the Use of This Jig and Saw

and operation of a segment-joining jig, which was developed in a campaign to increase pattern-shop efficiency. Thin flanges and loose rings are always troublesome to construct, largely because of the difficulty in joining the segments effectively. When made by almost any of the commonly used methods, their cost is excessive. But with the arrangement shown, any circular saw may be equipped to cut economically tongue-and-groove joints. The construction and operation of the contrivance will be obvious from a study of the illustrations. Each slot is cut with the jig held in one position by the dowels. Then for the next slot the jig is moved ahead one dowel hole before the saw cut is made.—D. D. Gurnee, Hempstead, N. Y.



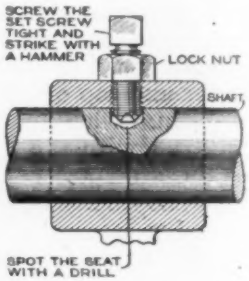
¶Good, tough rivets for use in fiber or pasteboard can be made from wire solder.

How to Make Wax for a Dance Floor

To make powdered wax for a dance floor, melt, in 66-deg. benzine, as much wax (paraffin will do) as the liquid will take up, then stir in some talcum powder to form a fairly stiff paste. Rub this through a No. 1 sieve and spread out thinly on trays, to permit evaporation of the benzine. Be careful about fire. When the mass has become perfectly dry, pulverize it and place in tin cans with perforated tops; use by sifting it on the floor.

Overcoming Setscrew Loosening

Cup-ended setscrews, which are used for holding collars, flywheels, gears, keys, etc., in place on shafting, frequently loosen and cause trouble, unless the setscrews are properly fitted. The best method of fitting such screws is to spot-drill the seat, and screw the setscrew in place firmly, then strike the head of the setscrew sharply several times. The final tightening gives the cup face a firm seating on the shaft, and it is not likely to loosen. A hexagonal nut will give additional security if placed on the setscrew and tightened after the setscrew has been upset with the hammer. This will lock the piece against loosening, even though there is excessive vibration.—Geo. A. Luers, Washington, D. C.



Simple Method of Saving on Typewriter Ribbons

Users of small portable typewriters will obtain double service from the same investment in ribbons if, instead of buying the ribbon regularly supplied for the machine, they will provide themselves with a 20-yd. ribbon

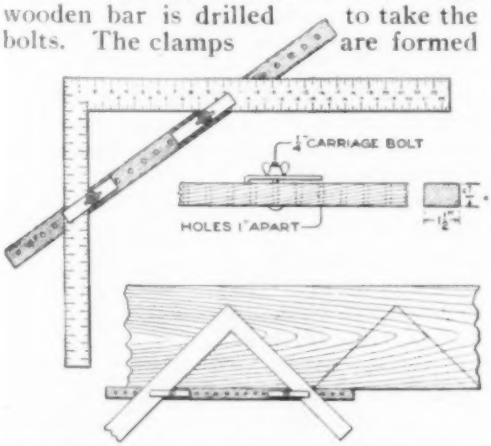
of the same width, such as are used on most office typewriters. Ribbons of the portable typewriter are usually 10 yd. in length. For such a ribbon one pays 75 cents or $1, the same as for the longer ribbon that is used on office machines.

By buying the 20-yd. ribbon and cutting it in two, one has two ribbons for the little machine at the same price ordinarily paid for one. If the portable typewriter is provided with a two-color adjustment and one is able to get along with one color, the service of four ordinary ribbons may be obtained from the one 20-yd. ribbon. After being cut to form two ribbons, each ribbon is used on both edges by manipulating the two-color shifting adjustment.—John Edwin Hogg, Alhambra, Calif.

Handy Square Attachment for Laying Out Stairs

After the riser and tread have been decided, this device is handy in scribing the stair stringers. It consists of a carpenter's square, and a wooden bar with clamps which hold the bar and square snugly together. When set, there can be no slipping, and thus all marks are regular and the finished job uniform.

The illustration shows how the wooden bar is drilled to take the bolts. The clamps are formed

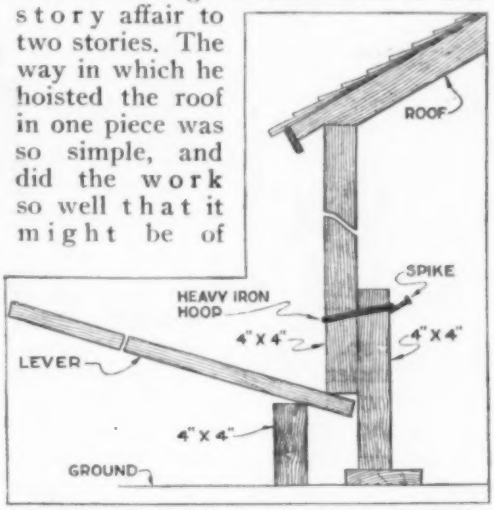


With This Device Attached to an Ordinary Carpenter's Square, the Laying Out of Steps is Made Easy

of strips of 3/16 by 1¼-in. steel.—C. C. Spreen, Flint, Michigan.

Novel Method for Lifting Large Objects

A short time ago a neighbor undertook to enlarge a barn from a one-story affair to two stories. The way in which he hoisted the roof in one piece was so simple, and did the work so well that it might be of



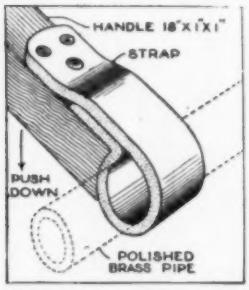
The Entire Roof of the Barn was Raised by Prying Up Each of the 4 by 4-Inch Timbers a Little at a Time. The Iron Hoops Kept Them from Slipping Back

value to others. The roof was severed from the sides, resting upon temporary supports, and several boards were removed from the sides. Then six or eight hoops were made at the blacksmith shop, a little over 4 by 8 in., inside dimensions. These being made ready, a number of timbers, 4 by 4 in. in size, were secured and arranged as shown. One was set in the wall where a board had been removed, to help support the roof. A shorter one was placed against the first, and the hoop slipped over both. A spike was driven into the shorter one to support the hoop. All the timbers and hoops were arranged in this manner, and when ready, it was but a simple matter to go around from one to the next, lifting each one a little in its turn.

The action of the hoop is obvious. As the roof is raised, the hoop allows a movement of the timber up, but when released, automatically clamps and holds it against an opposite movement. The whole cost for material was $4, and the roof was raised in an hour.—Dale R. Van Horn, North Loup, Neb.

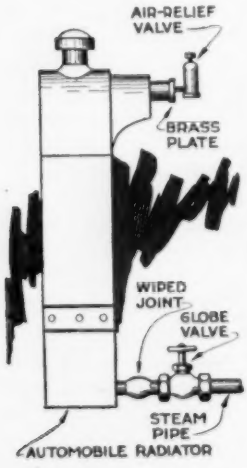
Wrench for Small Polished Pipes

A sure-grip wrench which can be used on highly polished nickel or brass pipe, without marring or crushing the tube, may be made in the following manner: Nail to one end of an 18 by 1 by 1-in. hardwood stick a strong leather, or canvas, strap of suitable length, as shown. Rub powdered rosin on the strap. Wrap it around the pipe in the manner shown. Use the wooden-stick lever as a handle. To turn the pipe in the opposite direction, reverse the tool.—Walter B. Raynor, Patchogue, N. Y.



Automobile Radiator as a Heating Unit

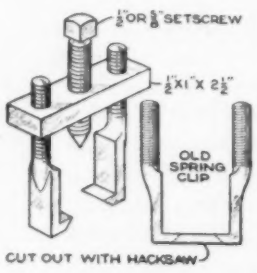
Having need of an additional steam radiator for one side of his show window, the depth of which was very scant, an automobile repair man solved the problem of fitting the additional heater by making use of a discarded automobile radiator, instead of the regular cast-iron or pipe kind.



For the purpose, a brass flange, to take the 1½-in. steam-pipe union, was wiped on the lower, or outlet, pipe of the radiator. The upper, or inlet, pipe was permanently closed with a brass plate soldered in place, making a tight fit. The plate was drilled and tapped with a ⅛-in. pipe tap, to receive the air-relief valve. A copper-asbestos gasket was fitted to the filler cap, which was screwed down hard in place. The precaution had been taken, of course, to solder up the small overflow pipe.

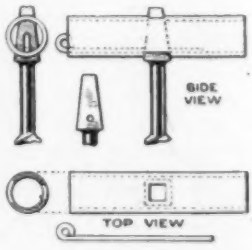
Gear Puller Cheaply Made from an Old Metal Screw Clip

This is a handy tool for emergencies. The difficulty of removing gears from their shafts is familiar to all motorists. This device has the merit of simplicity, cheapness, and compactness. An old spring clip is sawed apart, and two claws for gripping the gear are finished with a file. A steel bar is then drilled and tapped in three places, as shown. Into the center hole is screwed a pointed setscrew. The two claws are set on the gear hub or rim. The depth may be varied to meet the circumstances. By turning the pointed setscrew with a wrench, the claws start the gear or pinion, and pull it from the shaft smoothly and surely, even from a tight fit.



Handle for Bits for Close Work

When holes must be bored, or screws driven, and there is not much space in front of the hole, the handle shown in the sketch will be useful. The shank of the bit should be adapted for it by drilling a small hole, as shown. The handle is made of a piece of steel tubing, with two holes drilled and filed out square, of the proper size as determined by fitting in the bits. A key of steel wire holds the bits in place. In case of necessity, any square-shank



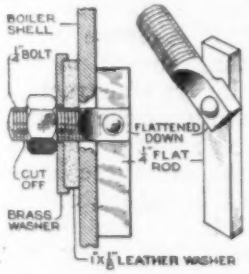
bit can then be used in the handle, whether there is a hole to take the key or not.—Henry Getaz, Pittsfield, Mass.

Simple Method of Making and Attaching a Metal Ferrule

Take copper or brass wire and wrap it around the place desired—as on a file or chisel handle. Solder as fast as wound, for the heat of the iron will expand the wire, and when it cools the ferrule will be as sound as though it were solid metal, forced on. Use about No. 20 gauge wire for small ferrules; No. 14 or 12 can be used for very large sizes.—J. Garrett Kemp, Stillwater, Oklahoma.

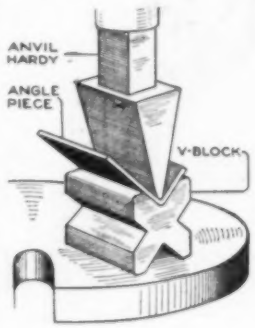
A Durable Solderless Repair for Boiler Leaks

When a leak is discovered in a small tank, or boiler, such as the reservoirs on many kitchen ranges, the problem of repair is often difficult, because solder does not stick well to the corroded surface, and only one side of the tank wall can be reached for a mechanical repair. Materials required for this device are a ¼-in. bolt and nut; a small piece of rod, or sheet steel, about ⅛ by ¼ by 1¼ in.; a ⅛ by 1-in. brass washer; a ¼ by 1-in. leather washer, and a small rivet, or piece of soft steel wire. The bolt, after the head is removed, is flattened out, as shown, a hole is drilled in it, and the flat rod is riveted to it. While riveting, a slotted shim should be placed between the two pieces, so that it can be removed afterward, leaving a loose joint. The leak in the tank is enlarged if necessary, and the flat rod is pushed through the hole, long end first. When it has completely entered, it will drop to the perpendicular position, and the washers and nut are put on the bolt.



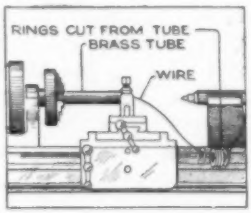
Angle Pieces Shaped in V-Block with Arbor Press

An order came in for a large number of angle pieces of odd size. To do the work quickly, and with some degree of accuracy, it was necessary to bend the pieces in some form of die in a press. Neither press nor die were available, but an arbor press and a V-block were among the shop equipment. The sketch shows how the pieces were made by the use of the arbor press, the V-block, and an anvil hardy. By bringing the plunger of the press down on the hardy the angle was formed in the V-block. The hardy should be blunt, otherwise there is danger of breaking the stock at the bend.—Harvey Mead, Scranton, Pa.



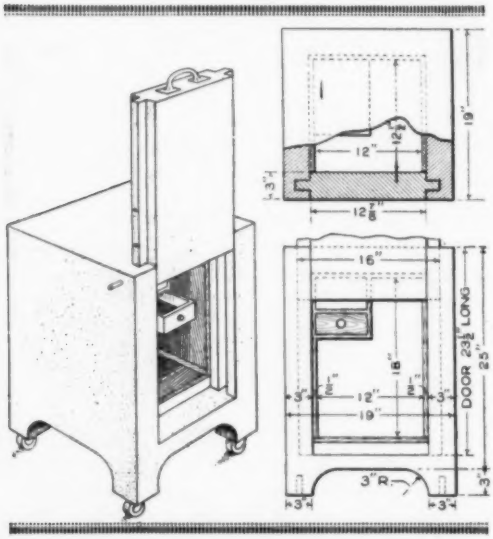
Wire Used to String Rings as They Come from Lathe

When a large number of brass, bronze, or cast-iron rings are turned from a single piece of stock, a heavy wire arranged for catching them as they come from the lathe will be found useful. The wire may be secured to any convenient point at the right-hand end of the machine. The other end is permitted to ride free inside the stock from which the rings are being cut. It is obvious that with this arrangement the rings are automatically strung on the wire as they are cut, and may be removed with a single operation when the stock becomes exhausted.—George L. Furse, St. Louis, Missouri.



How to Make a Fireproof Concrete Safe

The chief features of this safe are simplicity in construction and cheapness. About two sacks of cement are needed. If desired, the safe can be given a good black finish by mixing about 1½ lb. of lampblack into the cement.



Fireproof Safe Made of Concrete can be Built at Home at Very Low Cost

It will be noted that the door slides up to open. The door can be latched open by means of a rod spanning the opening, moving freely in holes cored into the concrete. The end of such a rod is shown in the view of the completed safe, projecting from the side, near the top of the opening. For convenience in handling, the safe should be set on casters. Mold sockets for the casters when pouring the concrete.

An Improvised Furnace for Small Casehardening Jobs

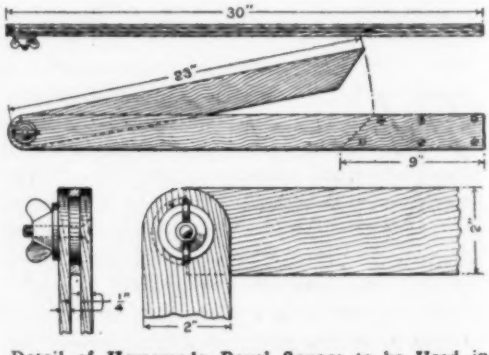
A good substitute for a casehardening furnace for small work may be had by capping one end of a length of iron pipe and plugging the other end with fire clay, after the material to be hardened has been placed inside. The pipe is then placed in the usual casehardening furnace or heated in the brazing machine.—Abel Greenstein, New York, New York.

Doors Have Removable Panels for Summer and Winter Use

Doors of permanent construction having a large removable panel are fitted with glass sashes for winter use and with screens in summer. This eliminates changing an entire door for seasonal variations.—J. S. Hagans, Toledo, Ohio.

Bevel Square for Door and Window Fitting

Openings for doors and windows are seldom square and true. Due to this condition much extra work is required when they are being fitted unless suitable methods are used. With windows particularly, a poor job is a frequent occurrence, since they have to be fitted both at the top and bottom. No correction can be made if too much wood is taken off. Trying-in doors also is arduous work. Such difficulties are greatly minimized if a large bevel square, such as that shown in the sketch, is employed. Its construction is obvious from a study of the details. The only materials needed for the construction of this tool are three hardwood sticks, ¼ by 2 by 30 in., one ¼ by 1¼-in. stove bolt, one ¼-in. punched washer, one ¼-in. wing nut, and several ⅝-in. flat-head wood screws. The size of the square is such

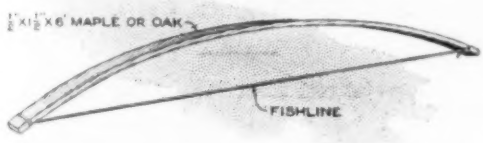


Detail of Homemade Bevel Square to be Used in Fitting Doors and Windows

that it will disclose any appreciable variation from the true in a large door or window opening and thereby permit the door or window to be cut accordingly. Yet the tongue, being 23 in. long, is sufficiently short to be used in openings only 2 ft. wide.—Henry Simon, Laguna Beach, Calif.

Snap Bow Aids in Making Chalk Lines

The chalk line is often much quicker to use for marking than a straightedge and pencil, but fastening the far end, or having some one to hold it, makes it inconvenient. A snap bow will enable one to use the simple and accurate chalk-line method without trouble. The fishline may be rubbed with white or colored chalk, laid against the surface to be marked, and picked with the

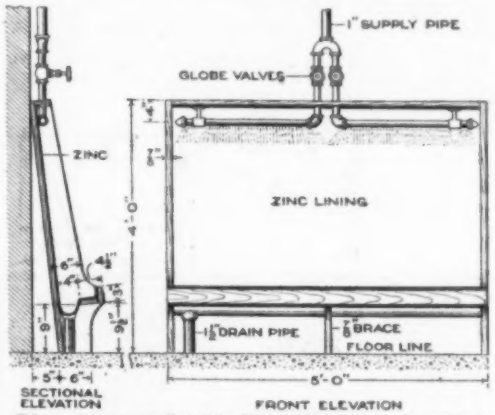


The Snap Bow Provides a One-Man Way to Use a Chalkline

finger. The device has been found useful in scenic painting.

A Quick and Convenient Blueprint Washer

There are a great many methods of washing blueprints, but a spray washer, constructed as shown in the illustration, will prove as economical and satisfactory as any in a shop where a large number of prints are made. A wooden tray of suitable size is made and covered with zinc. The water is admitted to the tray through two spray pipes which are drilled with holes through about 45° of their lower surfaces. When a print is to be washed, the water is turned on and permitted to wet the zinc thoroughly. Then it is shut off, and the blueprint, with its sensitized side out, placed on the zinc in the back of the tray, so that the top edge of the print is high enough to prevent the water from spraying above it. With the print in position, the water is again turned on and will

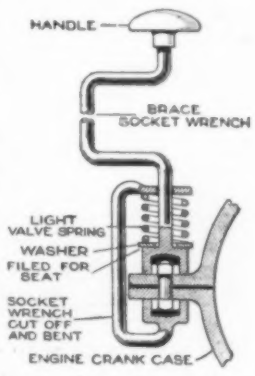


Blueprints are Quickly Washed in Running Water with This Device. For Small Prints, Only One of the Valves need be Turned On

quickly wash off the sensitizing chemicals. Experience has shown that the prints will dry quicker when washed in this manner than when washed by soaking them in a large tray, and the prints are not so likely to become torn. —W. J. Carol, St. Louis, Mo.

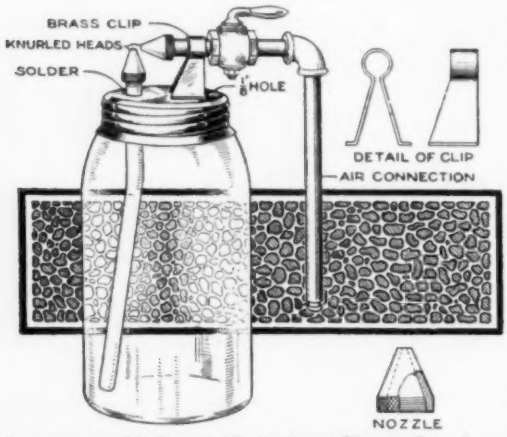
A One-Man Wrench for Automobile Crank-Case Bolts

The socket wrench shown in the drawing was devised by an ingenious repair man who had felt the shortage of workmen. It is made by combining two socket wrenches so that one holds the bolt head while the other is used in the ordinary way. The construction may also be adapted, though not so readily, to the type of wrench which uses only one handle with a head for each size of nut. The device will be quite useful in many other cases where two men would otherwise be required.



Sprayer or Air Brush Easily Made from Common Materials

Secure an ordinary preserving jar, either quart or pint size; also about 18 in. of ⅛-in. pipe, a small pet cock,



Sprayer, or Air Brush, Made from Mason Jar, for Finishing Small Parts, Such as Plaster Casts, and for Stenciling

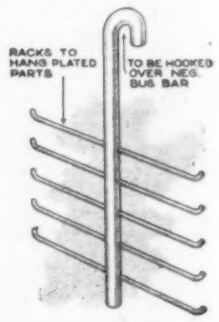
an ell, and a piece of sheet brass, 2 by 5 in. Drill a hole in the fruit-jar cap to fit the pipe; also another, ⅛ in. diameter, about ¼ in. from the edge of the cap, to act as an air vent. Thread one end of the pipe, and bend as shown in the sketch. Allow 1 in. of the threaded end of the pipe to project beyond the cap, and solder the pipe to the cap.

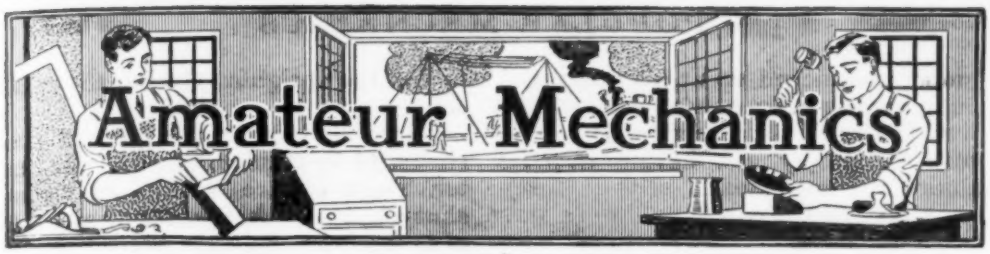
Cut three additional pieces of pipe, as follows: one 6 in. long, and two 2 in. long. Thread both ends of the smaller pieces and one end of the 6-in. pipe. The other end of the 6-in. pipe is grooved to take the air hose. The sheet of brass is shaped into a clip, and bent so as to fit the pipe and form a support for the 6-in. pipe. Two caps, or nozzles, are turned on a lathe. The nozzles are threaded to fit the pipes, tapered, and drilled 3/64 in. at the smallest end. One nozzle is screwed to the piece of pipe on the jar cap, the other on a 2-in. piece of pipe. Assemble the parts as indicated in the sketch. The clip is soldered to the jar top and the nozzles centered.

The sprayer is now ready for work. Color is placed in the jar, and the air hose connected with the inlet of the sprayer, at the end of the 6-in. pipe. Adjustment is secured by turning the two nozzles. By having different jars with similar threads, various colors can be used without cleaning the jars. Liquid carbon dioxide is the most convenient source of pressure. Compressed air from any source is also effective. A regulator is required to vary the pressure, as heavy color mixtures require greater pressure than water colors or dyes. By having two or three outfits, different-size sprays can be obtained. Heavy colors require from 40 to 50 lb. pressure, while water colors, or dyes, require only 20 to 30 lb. Japan colors, oil, and varnish can be used. A great saving of time can be effected in painting or tinting plaster casts, artificial foliage, metal castings, papier-mâché forms, and in stenciling and similar work.—H. H. Marshall, Los Angeles, Calif.

Convenient Electroplating Rack for Small Pieces

Where a large number of small pieces are to be electroplated, time can be saved if, instead of wiring individually each piece, they are strung on the arms of a metal rack. Such a rack may be made quickly by inserting several 12-in. lengths of heavy copper or brass wire through equidistantly spaced holes drilled in a section of brass or copper rod. The wires should be soldered in place. Before the insertion of the wires, the upper end of the rod should be bent into a hook so that it can be suspended from the negative bus bar of the plating tank. Both ends of each horizontal wire should be bent upward to prevent the falling off of pieces hung on it.—K. M. Coggeshall, Webster Groves, Missouri.



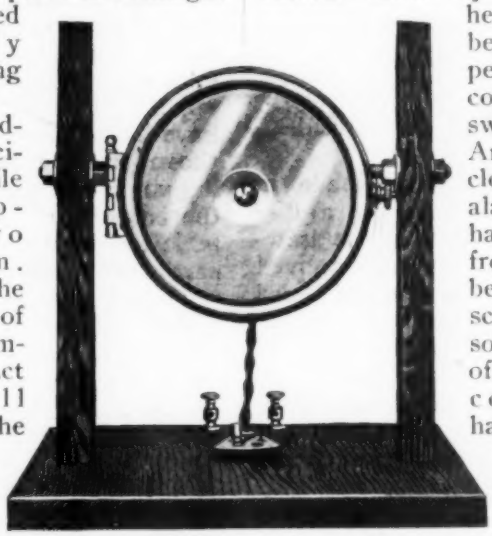


Electric Eye Opener Emulates Old Sol

By W. J. McGUFFAGE

PROBABLY no one will dispute the statement that it is very annoying to be awakened about 5 a. m. by the ringing of a neighbor's alarm clock. Heretofore the owner of the clock has usually had to take the blame and been classed as a nuisance, but he may now find relief in the device here described, which appeals to the sense of sight instead of that of hearing. Its action is based on the principle that sunlight entering a darkened room will usually awaken a sleeping person.

In order to take advantage of this principle, an automobile headlight was supported between two uprights, as shown. On account of the variation in size of headlights, it is impossible to give exact dimensions to fit all cases. The base of the instrument illustrated is of 7/8-in. oak, 1 ft. square. The uprights are of the same material, 1 ft. high, and taper from 2 in. at the base to 1 in. at the top.



The Rays of the Headlight Waken the Sleeper without the Shock Which the Ordinary Alarm Often Causes, and with No Disturbance to the Neighbors

Two round pieces of iron, each bent at a right angle, of a diameter to fit the sockets in the sides of the headlight, are required. These should be threaded and provided with nuts and washers to clamp each side of the uprights and hold the headlight in the desired position. A mission finish will add greatly to the appearance of the device. The alarm clock, which operates a circuit closer, may be located in another room if desired. The bell hammer on the clock should be removed; the lamp is then connected in series with the circuit closer, a six-volt storage battery, and a small switch mounted on the base of the instrument. All connections should be of sufficient capacity to carry safely the current taken by an ordinary auto headlight, which will be from 2½ to 4 amperes; No. 16 gauge copper wire will answer the purpose. Any of the circuit-closing devices for alarm clocks which have been described from time to time may be used. The one described was made by soldering a 2-in. piece of No. 12 gauge bare copper wire to the handle of the alarm spring winder. A movement of the wire, 1 in. in the proper direction, winds up the spring. When the clock "goes off," the wire closes the circuit by touching a small screw projecting from the back of the clock and insulated from it by a fiber bushing.

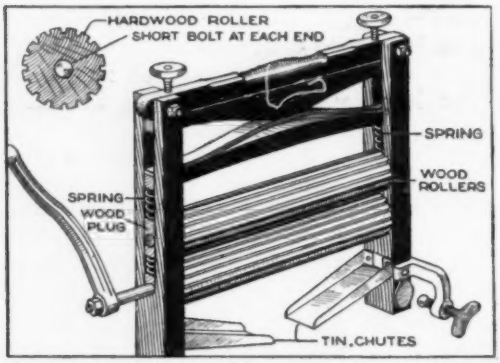
To put the apparatus in operation, turn the contact wire on the clock until it catches, set the clock to the time desired, and close the switch on the base. The light should be focused on the spot usually occupied by the sleeper's head.

The headlight shown in the photo-

graph was picked up at a secondhand automobile-supply house for $1.50; no trouble should be experienced in the construction by one having average ability and equipment.

Old Clothes Wringer Made into a Fruit Press

An efficient press for extracting the juice from apples, cane, rhubarb, and



Corrugated Rollers of Hard Wood, Substituted for the Rubber Rollers of a Discarded Clothes Wringer, Produced an Excellent Fruit Press at Practically No Expense

similar products, may be made at slight expense by rebuilding a discarded clothes wringer, as in the drawing. The rubber rollers are removed and replaced with rollers of hard wood, notched as shown. These are mounted by utilizing all the original wringer fitments. Two small tin chutes are fitted to the side-frame members, as shown, to divert the pulp and juices into a receptacle placed beneath.

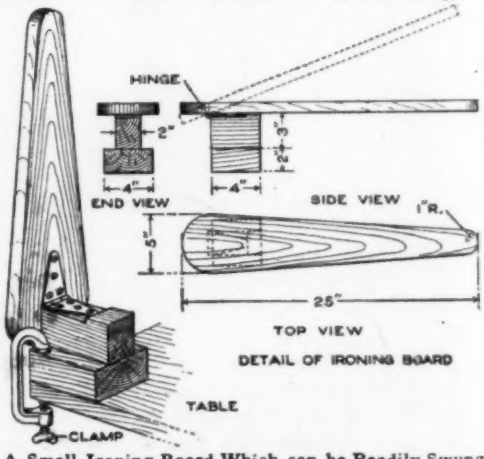
Small Bell-Ringing Windmills Protect Fruit from Birds

The windmills are mounted on posts in the orchard, high enough to get a breeze at all times. The base of the windmill is supported on a wooden pin on the top of the post, and revolves on it. The base is about 6 in. wide and 24 in. long, and carries two uprights, 3 in. wide by 8 in. high. An inch from the top of the uprights are bored ½-in. holes, which form bearings for the shafts. A piece spans the tops of the uprights to stiffen the structure.

The wings are made of two pine sticks, 12 by 2 in., notched at the center. The sticks are whittled into blades, about ¼ in. thick, and set at an angle of 45° to the wind. These are mounted on one end of the ½-in. shaft. At the other end is an ordinary dinner bell, about 3 in. in diameter. This is securely wired to the shaft, and balanced with lead strips on the handle, so it will revolve freely. A wooden vane keeps the windmill in the wind. The windmill is effective in frightening the birds out of the orchard.

Auxiliary Ironing Board for Small Work

A small detachable ironing board is an easily constructed household accessory of great convenience. A board 25 in. long, 5 in. wide at one end and 2 in. wide at the other, is hinged to the upper and smaller of two blocks that have been glued or nailed together, as shown in the sketch. The projecting portion of the larger block permits the base to be securely fastened to a table top with a clamp. The board is particularly serviceable for ironing small or sleeved articles. When larger



A Small Ironing Board Which can be Readily Swung Out of the Way is Very Handy When Ironing Sleeves or Small Garments

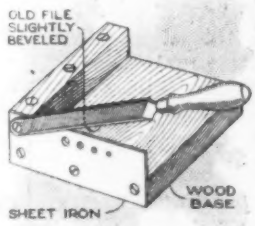
articles are to be ironed it can be swung up into a vertical position.—Arthur J. Kelly, Brooklyn, N. Y.

To Keep Tracings from Wrinkling

If a tracing is going to remain on the board overnight, or for several days, remove all but two of the tacks. This permits the tracing cloth to expand and contract with atmospheric changes. When resuming work, use the customary number of tacks. This plan prevents wrinkling.—C. C. Spreen, Flint, Michigan.

Handy Tool for Trimming Wire Made from an Old File

The tool illustrated is thoroughly useful about the electrician's bench, or in the home workshop where any considerable quantity of wire is used. It may be readily constructed from any old flat file and a few odds and ends, ordinarily obtainable in the scrap box. The base is made from two blocks of wood, as indicated, and to one end of these is screwed a piece of sheet iron, drilled as in the sketch, and slightly hardened. The file is detempered, by being heated, and allowed to cool slowly, before being drilled for fastening, and sharpened along the lower edge. It is then retempered and mounted, as shown. Wires to be trimmed are passed through the holes in the sheet-iron plate and sheared off by bearing down on the handle which is fitted to the end of the file.—R. H. D., London, England.

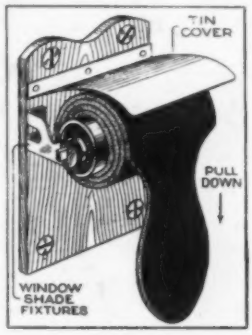


Soft-Rubber Washers to Prevent Leaky Valves

Substitute soft-rubber valve disks for the copper or hard-rubber disks generally used. They will require more frequent replacement, but will pay because they save water. It requires considerable effort to operate valves with hard disks, so most faucets drip continually.

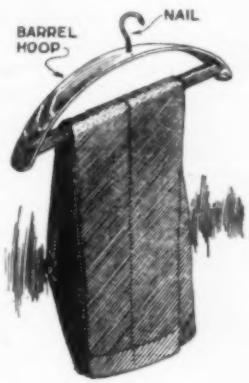
Dust-Proof Razor-Strop Holder

On finding that my razor strop became gritty and hard when left hanging on the wall, I devised a holder on which the strop is wound when not in use. It consists of a section of a spring-shade roller to which the strop is tacked. The roller rests in brackets screwed to a wooden base and the strop is rolled and unrolled like a window shade. A piece of tin above it affords additional protection.—John S. LaFleur, Haverhill, Mass.



Coat and Trousers Hanger Made from Barrel Hoop

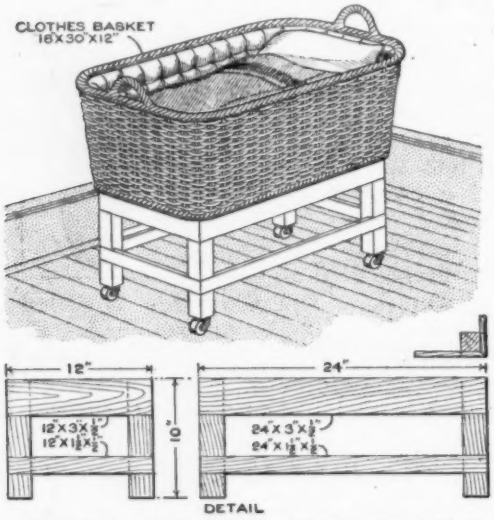
A combination coat and trousers hanger is easily constructed from a portion of a barrel hoop spread, as shown, by a straight stick fastened by small nails between the ends. Lacking a hook, one may be made by driving a nail through the hoop against some hard surface that will cause the end to be bent into a hook. A bit of tape wrapped around the end of the latter will prevent clothes being torn on it, and a coat of varnish will give the wood a smooth finish.—Joseph D. White, Camp Funston, Kan.



Small leaks in automobile tops and worn folds can be repaired by putting on a dab of heavy shellac, properly colored.

A Neat and Economical Baby Crib Made from a Clothes Basket

A clothes basket on a simple but strong wooden frame, mounted on castors, makes a cradle which is as convenient and sanitary as many which are sold for five times its cost. It is light enough to roll out on the porch without difficulty, and may be padded and fitted with pillows until the most exacting mother is satisfied. The basket and frame should be painted, preferably some light color. The whole cost, not including pads or pillows, should not be over $2.50.—A. Switzer, Denver, Colo.

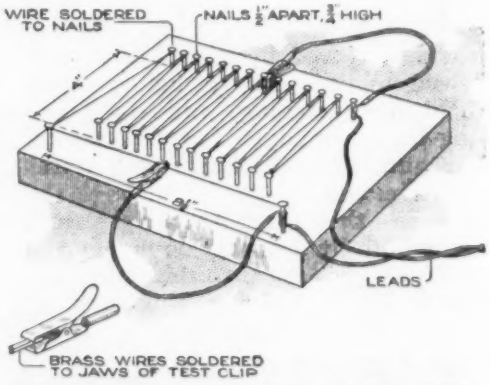


A Few Sticks of Wood and a Clothes Basket Make a Convenient Cradle for the Baby

A Small Rheostat for Experiments and Testing

A rheostat made as shown in the sketch has been used successfully for calibrating a large number of ammeters and wattmeters. One of the general designs suggested will be useful for many other purposes. The dimensions given were used for obtaining a variation of from ½ to 5 amperes with a 6-volt source of electromotive force. For other capacities the proportions may be increased or decreased proportionately. A piece of pine, 7 by 9½ in., forms the base. For resistance wire No. 16 gauge "Climax" was used, but wire of any material which will carry the maximum current without excessive oxidation may be employed instead. Nails support the resistance wire, which should be soldered to the nails to insure good electrical contact. Leads of flexible cord are arranged as shown. These are soldered to the first and last nails in the series. To provide connection between the free ends of the cord and the resistance wire or the nails, 5-ampere test clips are soldered to the cord ends. The teeth of the clip jaws are filed off, and in their stead a short piece of brass wire is soldered to each jaw, as indicated in the detailed view. A nick is filed in each of the brass wires so that they will hold firmly onto the resistance wire or nail. Suspender or display-case clips, suitably modified, may be substituted for the commercial test clips.

In using the device, one clip is moved along the front span. The other is gripped to a nail in the rear row. Sliding the front clip along the span wire insures a fine adjustment of resistance. Gripping the rear clip on the different nails provides the coarse adjustment. —R. F. Binney, La Vina, Calif.



This Homemade Rheostat Has a Capacity of One-Half to Five Amperes, on a Six-Volt Circuit

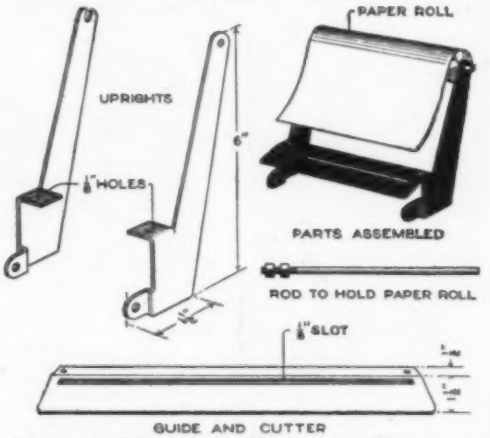
¶Glue applied to door-knob screws will prevent them from loosening easily, yet they may be removed without difficulty.

Roll-Paper Feed for Typewriter

Typewriter paper may be fed from a roll where only one copy is necessary and where maximum speed of production is essential. Sections, not to exceed about 11 in. in length, of the typed paper are torn off as necessary. This practice is followed often in newspaper offices. The roll paper can be purchased at any paper-supply house, cut to the width required by the user. The construction of a roll-feed attachment which may be mounted on any of the standard typewriters will be described.

First make the two uprights. Both are cut from 1/16-in. sheet brass, as shown. After cutting, heat the pieces to anneal them before bending. A hole is provided for the paper-roll rod in the right-hand upright and a slot in the left-hand one. A rod, threaded on one end and equipped with two nuts, constitutes the paper holder. For a guide plate and cutter, cut a piece of sheet brass, 1½ in. wide and of a length equal to that of the carriage, as detailed in the drawing. Bend it as shown. A 1/8-in. slot is cut almost the entire length of the guide.

In mounting the holder on the typewriter, the uprights are drilled at the base to engage the two small screws at the side of the carriage back of the roller. The exact location of these holes will vary in machines of the different makes. Next, the uprights are clamped into place with the screws, one at each end of the carriage. Then determine the distance between the arms of the uprights, drill a corresponding hole at each end of the guide-and-cutter plate, and fasten the plate to the uprights with small stove bolts. The roll of paper is placed on the rod and fed between the machine platen and roller as with single sheets. When the article or memorandum being written is finished, the paper is held against the guide plate and the blade of a pocketknife inserted in the slot. Passing the blade the length of the slot cuts off the paper, or it may be torn off at the slot. The end of the paper roll is again fed into the machine, ready for another operation.



A Paper-Roll Holder for Typewriters That can be Attached to Any Standard Machine

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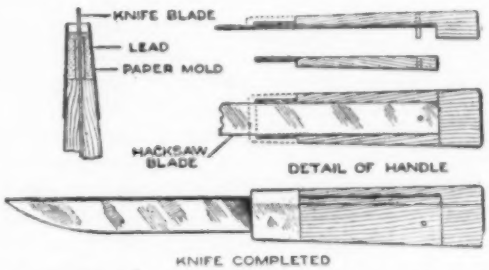
Handy Paring Knife Made from Old Hacksaw Blade

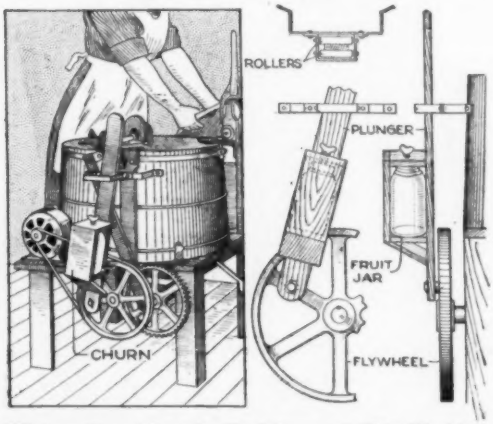
With a little work a hacksaw blade, or a portion of one, can be made into a paring knife that will prove very durable because of the excellent quality of the steel. Two pieces of hard wood should be cut into the shapes shown and riveted together with one end of the blade between them. After fitting a paper mold about the end of the handle from which the steel projects, melted lead is poured into it, to form a collar that will hold the parts firmly together. The exposed part of the saw can then be ground as desired.



A Serviceable Paring Knife Made from a Piece of Hacksaw Blade, and Details of Its Construction: The Handle and Blade are Held Together with a Rivet and a Lead Ferrule

Washing Machine Equipped with Churn Attachment

The owner of a power-driven family washing machine has provided an attachment for it with which he churns



Without Impairing the Usefulness of This Washing Machine a Plunger has been Attached to the Flywheel Which Does the Work of a Churn, a Jar for the Cream being Installed as Shown

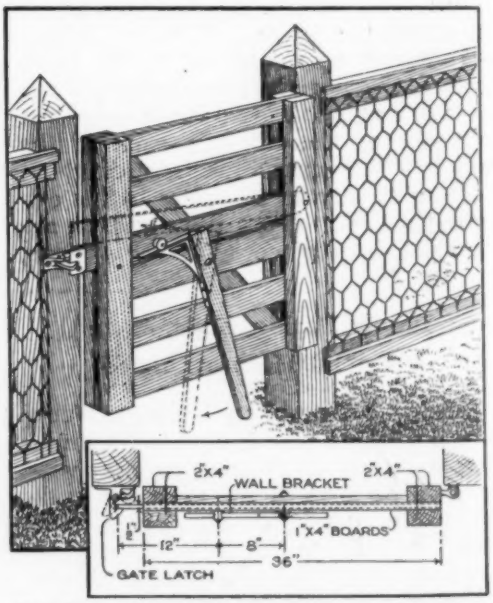
cream at a little additional expenditure of energy. A wooden plunger was bolted to the outside of the flywheel and its upper end placed between two rollers set in a metal frame attached to the side of the tub. Enough play was allowed between the rollers to permit the plunger to move up and down freely. A framework large enough to hold a glass fruit jar was attached to the side of the plunger, a thumbscrew being provided in its upper end with which the jar is held firmly in place. As the flywheel revolves, the movement of the plunger thoroughly agitates the contents of the jar.—Dale R. Van Horn, North Loup, Neb.

Treating Closets with Cedar Oil

Apropos of the article in a recent issue of Popular Mechanics Magazine entitled "A Cedar-Lined Oak Chest," readers who desire the advantages of a cedar-lined box or closet may accomplish it by the use of cedar oil. Painting the interior of a box with this oil will to all intents and purposes convert it into a cedar chest regardless of the kind of wood used. The cost of the oil is not great. A closet treated in the same manner will likewise keep out insects.—Robert E. M. Bain, St. Louis, Mo.

Barnyard Gate is Operated with the Foot

A gate which can be unlatched with the foot has proven a great convenience across a path on a farm where laborers frequently pass with both hands occupied carrying pails. Pivoted to the side of the gate, near its center, a beam, or foot lever, is hung in a vertical position, extending almost to the ground and having a shelf bracket fastened to its upper end. The horizontal arm of the bracket passes beneath a porcelain knob projecting from a pivoted bar that engages the elbow catch. By pushing the vertical beam to one side with the foot the bar is raised above the catch, allowing the gate to swing open. If the gate is properly hung it will close of itself, the elbow catch serving to prevent its being opened again, except when the bar is



This Gate is Unlatched by Operating the Foot Lever as Indicated. It Is a Special Convenience When One has Both Hands Occupied Carrying Pails or Bundles

raised.—T. C. McDowell, Adrian, Michigan.

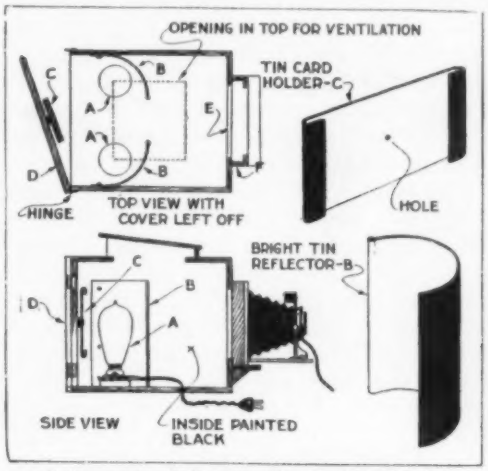
Improvised Post-Card Projector and Enlarging Camera

By HARRY MARCELLE

AN outfit which may be used for either projecting picture post cards or enlarging photographic negatives was assembled as delineated in the illustration. An ordinary camera, which provides the lens and bellows, is required, in combination with a dark box which can be built in the home workshop. The method of construction is this:

Make a box about 8 in. square out of ½-in. planed soft-wood stock. Nail the sides, but omit, for the present, the top and the bottom. The two openings thus left will be called the front and the back. Mount an 8 by 8 by ½-in. board, D, which constitutes a door, on the back with hinges and provide a hook to hold it shut. Cut a square hole, of the same size as that of the opening in the back of the camera which is to be used, in another 8 by 8-in. piece, E. This will constitute the front board. This front board is so cut that it fits in between the sides of the box instead of on the ends, as does the back. In the top, cut a square hole for ventilation. A hood is provided over this hole to prevent light being thrown forward.

When using the arrangement as a projector or magic lantern two 40-watt tungsten lamps, A, are required. Each lamp is mounted in a porcelain receptacle held on the floor with screws. A lamp cord, one end connecting the two lamps in multiple and the other fitted with an attachment plug, passes through a hole in the floor of the box. Form the two reflectors, B, of 8 by 7-in. bright tinned sheet-iron pieces, each having holes along one of its edges to admit of attachment. The reflectors are bent to a semicircular contour before mounting. The card holder is detailed at C. It is a piece of tinned sheet iron bent to the form shown so that it will hold a post card. A hole is drilled in its center for a screw pivot. It can then be fastened to the center of the back door and can be turned into position for either horizontal or vertical pictures. A washer is inserted on the screw between the holder and the door. The thickness of the camera body having been determined, a slide is fastened to the front board, as diagrammed, to support this body.



An Ordinary Small Camera, Fitted with This Attachment, Becomes an Enlarging and Post-Card Projecting Camera

Before it can be used as a projector it must be adjusted to operate with the camera of the type and size available. The adjustment, which must be made in a darkened room, having on one of its walls a white screen on which the image will be projected, is effected thus: Remove the back from the camera and place the camera in the slide without extending the bellows. Open the shutter. Insert a card in the holder C. Light the tungsten lamps. Now move the front board, with the camera carried on it, back and forth within the box until the components are in focus, that is, until the most distinct image obtainable is reproduced on the screen. Then, illuminate the previously darkened room and nail the front board in the position thus determined. These adjustments having been made, paint the box, inside and out, a coat of dead black. Everything should be painted black except the reflecting surfaces of the tin reflectors and the incandescent-lamp bulbs. The front board having been fastened, subsequent focusing can be effected by shifting longitudinally

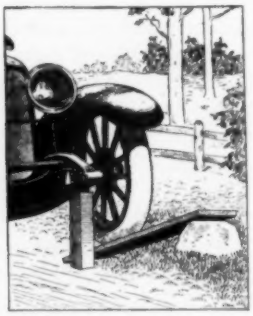
the lens board of the camera. The image of any sort of a picture that will fit in the holder can be reproduced. Colored post cards will project in their natural tints.

To make enlargements with the same box, a few minor changes are necessary. When employed for enlargements the tungsten lamps, which are required for projection, are not used. They may, however, remain in the box and can be disconnected from circuit by unscrewing them a few turns. The negative, or film, which is to be enlarged, is held in the opening E. Where a film is to be reproduced, it is held between two pieces of glass which are fastened to the inside of the front board with small clips. If a glass negative is used, the two additional glass plates are unnecessary. If the negative does not fill the opening in the camera, a mask cut from heavy black paper will be required to cut off the light.

The light for the enlargement is furnished by another tungsten lamp mounted in a porcelain receptacle which is screwed to a board which constitutes a base. This light source is moved about in the house until it is directly back of the opening E in the front of the box and until the light is distributed equally over the entire negative. To focus, move the camera backward or forward. While focusing, use a yellow glass, or ray screen, to cover the lens. When focusing has been completed, the shutter is closed and the ray screen removed. Then stop down the lens to bring out detail, and expose.

Changing a Motor-Car Tire without a Jack

It occasionally happens that a motorist fails to have a jack at hand when a tire needs to be changed on the road. The situation is easily met with the aid of a strong board and a couple of blocks or rocks. Driving the desired wheel onto the incline, provided in the manner illustrated, and setting the brakes, a block is placed beneath the axle. The board is then knocked out of the way.—John Peters, Milwaukee, Wis.



Roller Truck for Use in Scrubbing

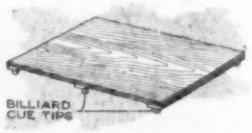
A little padded platform on wheels takes most of the drudgery away from scrubbing in hotels and office buildings. The platform carries the pail as well as the scrubber, and enables the scrubber to keep dry.—Florence L. Clark, McGregor, Ia.

Economical Use of Wood Alcohol in Small Cooking Stove

A couple eating breakfast and supper in their room used a chafing dish for cooking. A hard alcohol was used for fuel, and the expense seemed too high. So a fuel can was filled with pulverized asbestos pipe covering, and then saturated with wood alcohol. A quart of alcohol lasted about a month.—Charles A. King, Plymouth, N. H.

Attractive Table Stands for Hot Dishes

Attractive stands which will preserve the dining table from injuries, or heat marks made by hot dishes, can be easily made from thin pieces of board cut oblong or oval. After the board has been cut the proper size, cleats are fastened to the underside to which billiard-cue tips are attached to serve as supports. The stand should be varnished and waxed to match the table.—George L. Furse, St. Louis, Mo.

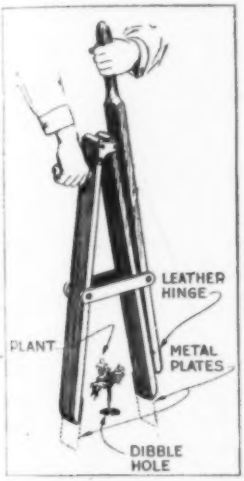


Cord Used as Spacer for Curtain Rings

To make the curtain rings space automatically along the curtain pole, tie a cord from one ring to the next, spacing the rings uniformly. Or the cord may be attached at uniform distances to the curtain. A pull at the edge of the curtain will space the rings evenly every time.—Frank L. Matter, Portland, Ore.

Device for Packing Earth in Transplanting

When tomato or cabbage plants are to be set out in considerable numbers, the simple implement shown here makes stooping over to press the dirt about the plants unnecessary. After a row of plants has been set in dibble holes and watered, the soil can be packed about their roots quickly while one is standing upright. The jaws of the device are actuated by means of the hinged lever.—A. S. Thomas, Amherstburg, Ont.

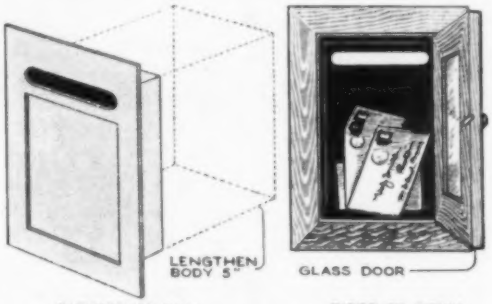


Cleat and Pulley Fastenings to Adjust Clothesline

The following kink will relieve the housewife of the trouble of sagging clotheslines, and hubby of constantly being asked to tighten up the line. The cost should not be over 25 cents, as all that is needed is a pulley cleat and hook, all of which may be had at any ten-cent store. When the line gets slack, it is pulled tight through the pulley and tightened up in the cleat.—S. H. Johnson, Westville, Conn.

Convenient Type of Mail Box for Home Use

A person having a mail box set flush in the outside wall of his home can, with a little alteration, make it accessible

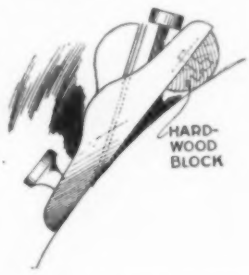


The Mail Box is Lengthened So That It Reaches through the Wall to the Inside, Where a Door is Placed through Which the Mail can be Removed

from inside the house. After removing the back side of the box a tin extension should be soldered to the box giving it sufficient length to reach through the wall in which an opening of the proper size has been cut. The enlarged container is completed by adding a glass door to the inner end which enables one to ascertain its contents at a glance.—A. Pertle, Chicago, Ills.

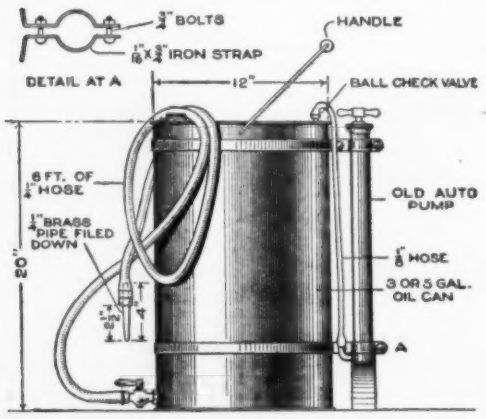
Block Plane Converted for Use on Circular Work

Few amateur craftsmen can afford to own a circular plane, yet this tool is decidedly necessary for such round work as table tops, half-round shelves, segments, and the like. Any ordinary block plane will accomplish such work if equipped as illustrated. A piece of half-round hard wood is cut the width of the plane and attached with countersunk machine screws, as indicated. The block elevates the rear end of the plane, causing it to follow the curve of the work on which it is used.



Pressure Spray Made of Old Oilcan

In making a spraying outfit for garden use, or similar purposes, a 3 or 5-gal. kerosene can and tire pump may be



Old Material Makes a Spray That Is as Good as the Manufactured Product, at Less Cost

satisfactorily employed. The latter is attached rigidly at the rear of the container with iron straps, as shown. A ball check valve is fitted in the top of the receptacle and connection is made between it and the pump with the pump hose. A 6-ft. length of ¼-in. rubber tubing is wired to the drain cock. An 8-in. piece of ¼-in. brass pipe is filed down and wired in the spray end of the hose to serve as a nozzle.—P. P. Avery, Garfield, N. J.

Keeping Tools Bright and Free from Rust

Bright-finished tools can be preserved against rust by coating with linseed oil, and allowing the oil to dry as a film. If more body is desired, oxide of iron, very finely powdered, should be mixed with the oil. Another antirust coating is made by dissolving ½ oz. camphor in 1 lb. melted lard. The mixture is skimmed, and fine graphite added to make an iron color. Clean the tools and smear with this mixture. Let the tools stand 24 hours, and rub clean with soft cloth.

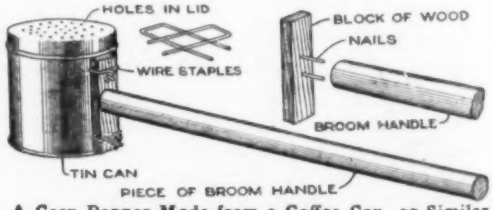
A good method of removing rust is to cover the metal parts with sweet oil, rubbing it in well. Let stand 48 hours; then rub with finely powdered, unslaked lime. Next immerse the article for a few seconds in a solution of ½ oz. potassium cyanide in a wine glass of water. Then clean with a paste of potassium cyanide, castile soap, whiting, and water, using a toothbrush. Potassium cyanide is a strong poison, and should be used carefully.—E. Standiford, Youngstown, Ohio.

Repairing Leaks in Pipes

Frequently a cast or malleable-iron pipe fitting will leak through its side, the water oozing, drop by drop, from a pinhole—ordinarily due to a sand hole in the casting. Sometimes the leak can be stopped by hammering the affected spot with the ball end of a hammer. If this fails, it is necessary to replace the fitting. Where the leak is around a thread, screwing the pipe or fitting tighter constitutes the only, and usually effective, corrective.—L. A. Merton, St. Louis, Mo.

Corn Popper Made from Coffee Can and Broom Handle

With an old coffee can, or similar tin receptacle, and a piece of a broom handle, 2½ or 3 ft. long, it is easy to make a corn popper that is preferable in many ways to a wire one. Take a strip of wood a little shorter than the height of the can to be used, and after boring two holes in it to prevent its splitting, nail it to the end of the handle. The latter is then fastened to the side of the can with two wire staples, as shown. Holes are made in



A Corn Popper Made from a Coffee Can, or Similar Tin Receptacle, and a Piece of a Broom Handle

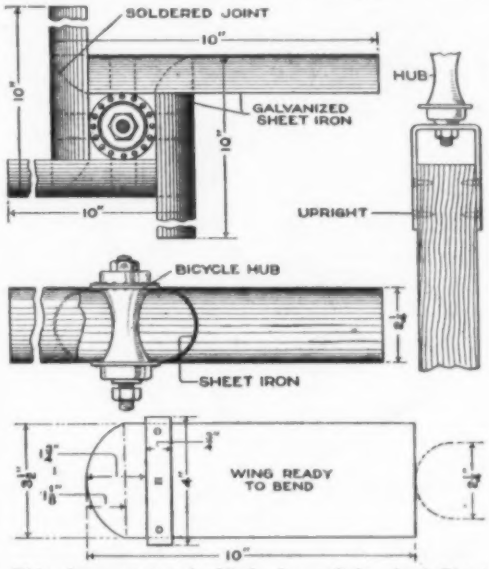
the can top to admit air to the corn while it is popping.—James Crouse, Dixon, Ky.

An Easily Constructed Ball-Bearing Anemometer

By THOMAS A. REYNOLDS

AN anemometer is an instrument which measures the velocity of the wind. The anemometers used by the weather bureau consist of four hemispherical cups mounted on the ends of two horizontal rods which cross at right angles and are supported on a freely turning vertical axle. Since the concave sides of the cups offer more resistance to the wind than do the convex sides the device is caused to revolve at a speed which is proportional, approximately, to that of the wind. The axle, to which the rotary motion is transmitted from the cups, is connected to a dial mounted at the foot of the supporting column. This dial records automatically the rotations. The reproduction of such a registering mechanism would be rather complicated. Hence, in the arrangement to be described none will be employed. Therefore, one of these improvised anemometers, when mounted on a high building, will indicate by the changing rapidity of its revolutions only the comparative, not the real, velocity of the wind.

In constructing the instrument, straight, dished vanes will be used instead of hollow cups. The vanes operate almost as effectively and may be combined more readily into a sturdy rotating unit. A bicycle front hub is utilized to constitute a wear and noise-proof bearing having minimum friction. Each of the four wings is formed from a piece of galvanized iron, measuring 4½ by 10 in., which has one end cut to a curve as shown. To each wing is fastened, with tinners' rivets, a 4-in. length of ¾ by 1/16-in. strap iron. Form each of the strips into a trough-shaped vane, measuring 2¼ in. from edge to edge—this being the distance between the spoke flanges of a bicycle hub. Some cylindrical object of suitable diameter will serve as a form for bending. Place the ends of the support strips between the spoke flanges and rivet them securely. The rivets pass through the spoke holes. Some trying out may be required to insure a symmetrical arrangement of the parts. Solder the curved end of each wing to the inner surface of the adjacent wing. Place



This Anemometer is Made from Galvanized Sheet Iron, a Bicycle Hub, and a Few Iron Straps. Practice in Observing Its Motion will Enable One to Estimate Fairly Closely the Wind's Velocity

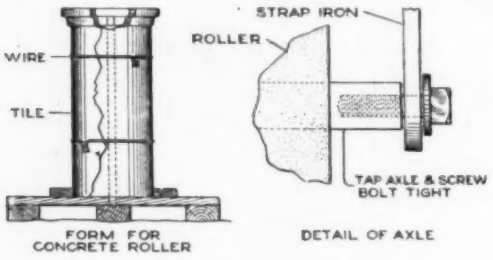
a tin cap—a salve-box lid will do—under the upper locknut on the hub to exclude rain from the bearing.

The supporting upright may be a heavy wooden rod, or a piece of iron pipe. A yoke of 1 by ⅛-in. strap iron, held to the top of the upright with screws, is provided for the attachment of the hub. The locknut on the hub clamps it to the yoke. Apply a coat of metal paint to the iron parts which are exposed. Mount the device sufficiently high to give the wind free access to it from all directions. The curve at one end of each wing is an irregular one. Hence, its accurate construction involves a knowledge of sheet-metal pattern drawing. However, if it is made of a form similar to that shown it will fit sufficiently well to permit a good soldered joint.

¶Boards exposed to the weather should be laid with the heart side down, as determined by examining the end grain.

Concrete Lawn Roller Cast in Cracked Tile

A concrete lawn roller, weighing about 200 lb., can be cast in a cracked



Concrete Lawn Roller Cast in a Cracked Tile and Provided with a Handle from an Old Lawn Mower

tile, 2 ft. long and 10 in. in diameter. A small platform should be made and a hole bored in it to receive the end of the rod, or bar, that is to be the axle. When the latter is in position, the tile, bound round with wires to strengthen it, is placed about it, the rod being properly centered. About 10 days after the concrete has been poured the tile may be broken off and an old lawn-mower handle attached to the axle by means of bolts, as shown.—Fred H. Quantmeyer, Westwood, New Jersey.

Gold or Aluminum Leaf Made from Bronze Powder

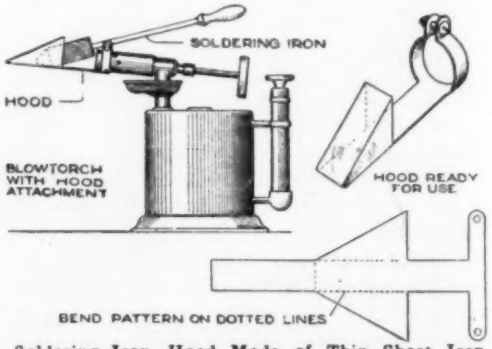
Light-weight gold or aluminum leaf, for signs, impressions on book covers, etc., can be made as follows: Dissolve 1 oz. of colorless celluloid in a mixture of 1 pt. each of water-free amyl acetate and fusel oil. The solution should be left standing for 24 hours. Pour 1 or 2 oz. of this stock solution into a 4-oz. wide-mouthed bottle. Mix with enough aluminum or bronze powder to make a bright gold color when the bottle is shaken. Fill a shallow pan with water to a depth of 1 or 2 in. Pour a drop or two of the gold mixture on the water. It will spread in a thin sheet on top of the water. Leave standing for about 15 minutes, when the sheet can be removed with a table knife or other flat tool. The sheet is then left to dry in the air and cut to size. Varnish size is used to make the leaf stick.

Simple Method of Bluing Screws

Put wood or machine screws in the chuck of a lathe and sandpaper the heads to a fine grain. Then put the screws in a tin tray, and heat until they start bluing. Cool in machine oil; then take out of oil and dry.—Frank Harazim, New York, N. Y.

Handy Blowtorch Hood Conserves Heat

This hood forms a holder for the soldering iron while being heated, and concentrates the heat, without waste. The materials required are a piece of stovepipe iron and a stove bolt. A pair of tinner's snips will be needed to cut out the pattern, which is of the shape shown and of dimensions to fit the blowtorch. Bend the shaped piece on the dotted lines, curve and drill the clamp ends, then bolt it over the burner tip. The hood is easily removed after



Soldering-Iron Hood Made of Thin Sheet Iron, Showing the Pattern, and the Completed Device Unattached and Fitted to the Blowtorch

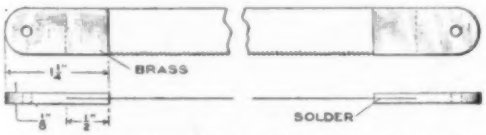
the soldering job has been finished.—B. W. Butler, Truman, Minn.

Keyhole Saws for Making Jack-o'-Lanterns

Using a compass, or keyhole, saw in cutting out the features of the Hallowe'en jack-o'-lantern, makes the operation a great deal easier than with a pocketknife. The hard, tough pumpkin shell cuts easily and smoothly with the saw, and no ragged edges are left such as result when a knife is used.

Reinforcing Thin Hacksaw-Blade Ends

I wanted to make a fine cut in several pieces of steel, and did not have a thin hacksaw blade. So I ground one down to .015 in. thickness, but this weakened the ends so much that I could not tighten the blade without the metal breaking through from the holes to the ends of the saw. To overcome this difficulty I took two pieces of 1/8-in. sheet brass, and sawed a slot about the width of the saw blade, 1¾ in. long. A hole was drilled in each piece of brass, as shown, to fit the saw-frame hook. The

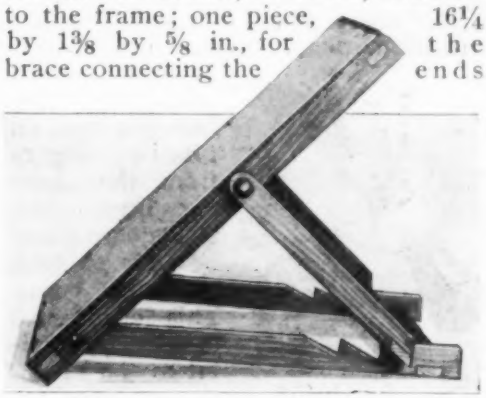


How a Very Thin Hacksaw Blade was Reinforced for Work in Steel

brass pieces were soldered to the ends of the saw blade, and it was ready for use.—S. G., Chicago.

Simple Bed Rest Gives Comfort to Crippled Soldiers

The photograph shows a bed rest which is being used in English hospitals. It may be readily built, and is a great convenience to invalids who are able to sit up in bed, but are not provided with adjustable beds such as many American hospitals have. The material required is as follows: Two pieces of wood, 21 by 1⅜ by ⅝ in., for the sides of the frame; three pieces, 15 by 1⅜ by ⅝ in., for the ends of the frame and the brace between racks; two pieces, 17½ by 1⅜ by 1 in., for the racks; two pieces, 11⅛ by 1½ by ⅝ in., for the two braces, or struts, attached to the frame; one piece, 16¼ by 1⅜ by ⅝ in., for the brace connecting the ends

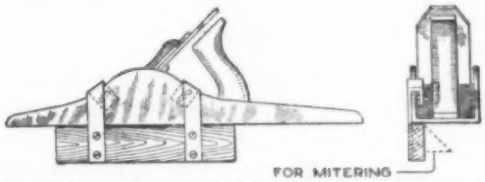


The Bed Rest Is Adjustable So That the Patient may be Made Comfortable

of the struts; and four pins, or bolts, with nuts. The method of assembly is clear from the photograph, and the rest can be built in a few hours.—G. H. Finch, Worthing, England.

Easily Made Jointer Fence for Amateur Craftsmen

Two strips of 1/8-in. steel, 1 in. wide, are mortised in the outer surface of a piece of ⅝-in. hard wood of 2-in. width, in constructing a serviceable jointer fence. They rise on either side of the central hump of the plane and are bent angularly to conform to the curves. A hole is drilled in each of the strips near the end and threaded to accommodate a thumbscrew. With the fence in use, long boards may be "jointed up" with accuracy and speed. By adjusting the cutter sidewise, a slight bevel is obtained. For mitering, prop-

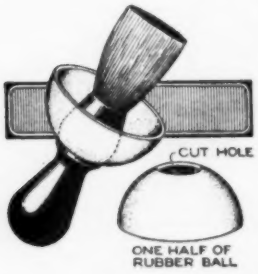


The Jointer Fence is Quickly Attached or Removed and Is a Serviceable Aid to Accurate Work

erly shaped strips are attached to the inner face of the fence.—Henry Simon, Laguna Beach, Calif.

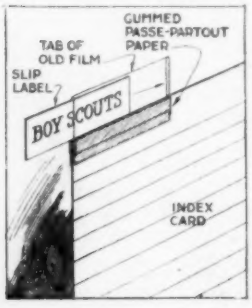
Drip Cup for Brush an Aid in Shaving

There are probably few men who have not felt more or less annoyed because of having water and soap suds run down on their fingers from the shaving brush just as they are about ready to take up the razor. This occurrence usually necessitates laying down the brush and reaching for a towel. The handle of the shaving brush may be kept dry at all times by the method illustrated. An old rubber ball is cut in two, and one of the halves is fitted over the handle, as shown. The rubber cup thus formed is not in the way, and serves to catch all water and lather that runs down.—William Warnecke, Jr., New York City.



Holder for Index Guides Made from Old Camera Films

Old camera films can be used to good advantage in providing any kind of filing cards with holders in which index labels can be inserted. The film should be soaked in warm water to dissolve the gelatin coating and then cut lengthwise into pieces 2 in. long and 1½ in. wide. Each piece is folded crosswise and fastened to the card with gummed passe-partout tape, the transparent holder projecting ½ in. above the card. Into it a paper slip, properly lettered can be inserted and, when desired, the label can be changed without harming the card.—Leon A. Haloin, Denver, Colo.

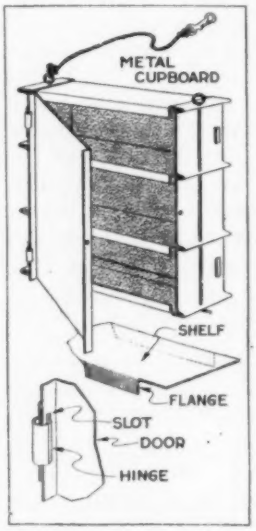


To Tap a Bolt Hole without a Tap

The proper tap for a hole was not handy, so a bolt was used as a tap. Its end was pointed with a file, and grooves were filed running longitudinally as in a tap. The bolt was then casehardened, and the retapping of the hole was done in the ordinary manner.

A Knockdown Cupboard for Camp Use

A medium-sized, knockdown cupboard for the average camper may be made of galvanized sheet metal. The two sides are V-crimped, as in the sketch, having holes punched through the backs to receive a wire key rod which is bent at the lower end after being inserted. The shelves are fashioned as shown in the drawing. The flanges act as a support to prevent sagging. After having completed the ends and shelves, a one-piece back is cut, leaving small tenons which project through the slots.



The door, also flanged, is held by 1½ by 1¾-in. metal strips, passed through slots and clenched, thus forming a hinge. The loops on the wire keys may be fitted with a rope and snap as a means for hanging up or carrying the cupboard.—Elmer O. Tetzlaff, DePere, Wis.

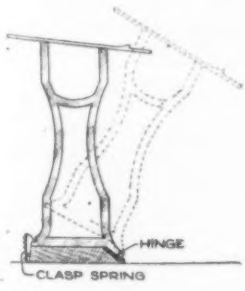
¶Soldering flux in paste form is convenient for use and easily carried in the pocket or tool kit by placing it in a grease cup of the size desired. By turning the cup, the desired quantity of flux is applied direct to one's work.

Soapsuds Maker Conserves Small Scraps of Soap

A simple suds maker that will enable scraps of soap, too small for toilet use, to be used for laundry work, may be made by perforating the bottom of a tin can and providing it with a handle, as in the sketch. A large coffee can, one with a turned edge, is best. Four ½-in. holes, or a larger number of smaller holes, are made in the bottom of the tin. The smaller the holes the more completely the pieces of soap may be converted into suds. In use, the suds maker is churned through the clothes boiler with the soap inside. The water rushing in and out through the holes quickly dissolves the soap.—R. O. Helwig, Chicago, Ill.

Hinged Foot Rest for Shoe-Shining Parlor

In a shoe-shining stand where hinged foot rests of the type shown are used, patrons are in no danger of catching or tearing their garments on these supports. A strong hinge is placed under the forward leg, attaching the rest to the step, and a spring catch is fitted at the back so that when the support is swung into a vertical position after the patron has taken a seat, it will engage a notch in the rear of the foot rest and will remain firmly in position until released by the attendant.—C. M. Martin, Kansas City, Mo.

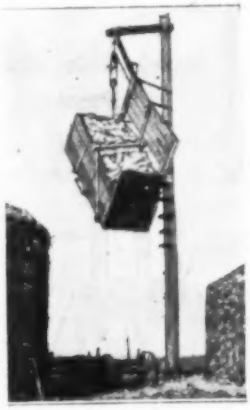


Ash Trays Made from Copper Ball Floats

Handsome ash trays of just the right size and shape may be made by home craftsmen from copper ball floats that have become leaky and thus outlived their usefulness. All that is necessary is to cut the ball in two, smooth off the edges, and provide it with feet. These may be either riveted or soldered on, after being cut and bent from the discarded half of the ball. The finished product should be sandpapered and polished until all traces of tarnish are removed. A coat of clear lacquer may then be applied to the outside to keep it that way.

Block-and-Tackle Hoist for the Farm

The simple homemade wagon-box unloader described herewith has proved very effective, and answers as well as the unloaders sold by farm-supply houses. A strong timber of the right height was planted, and an arm fastened at right angles to the top of the timber. The team works through a triple block-and-rope tackle. The box is lifted off the wagon gear, raised to the arm, and swung over the crib by hand. The end gate is pulled out, and the load empties itself. About 1,800 bu. have been unloaded this year, and the plan has been found very practical.—F. A. Carlson, Hawarden, Ia.

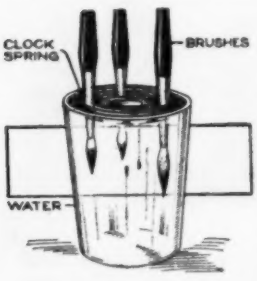


Makeshift Plow Plane for the Home Shop

A cabinetmaker's plow plane costs $5 or more, but the one here illustrated may be made from two shop scraps in a half hour. It will serve for an occasional job nearly as well as a factory-made one. The cutter is a chisel of the desired size, mounted in a groove sawed in the side of a hardwood block of suitable dimensions, and held in place by a wooden wedge. The bottom of the plane is rabbeted out so as to leave a tongue at the edge which follows up and guides the cutter when in use. To the opposite side a small strip is attached to serve as a width gauge. A hole is made above the cutter edge and shaped so as to allow the shavings to pass out. Of course, the plane is not adjustable, but the dimensions may be made to conform to the job for which the workman intends to use it.—T. A. Reynolds, Monroe, Wis.

Serviceable Paintbrush Holder Protects Bristles

Brushes used for show-card writing, and similar fine work, are damaged and even rendered useless if allowed to dry out or if dropped carelessly into a glass of water. This is a difficulty that is readily eliminated by the use of a brush holder, made by fitting a piece of clock spring into the mouth of a glass, as illustrated. The spring is coiled and pressed into the glass where its resiliency tends to hold it in place. The brushes are then inserted, as shown, to hang, bristles downward, in the water until ready for use.—L. C. Chaffee, Cleveland, Ohio.

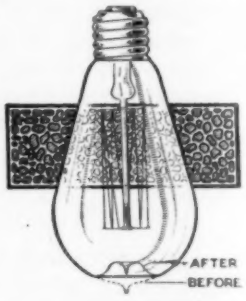


Photographing Frosted Window Panes

Photographic prints of frost formations on windows can be made direct on contact-printing paper. The design is covered with waterproof gelatin or isinglass, and the photographic paper is placed in position, under a smooth board, book, or the like, to get good contact with the window. About five seconds should be sufficient exposure.

Protecting Electric Bulb from Breakage

It is not infrequent that an electric bulb is ruined by the accidental breakage of its pointed tip. The danger may be obviated by holding the spike end of a globe in the flame of a blowtorch and turning it slowly. When the glass becomes soft the outside air pressure, on account of the partial vacuum within the bulb, will cause the depression of the tip.—H. C. Anderson, Vancouver Island, B. C.



Show-Card Colors for the Small Consumer

Show-card writers, using ready-mixed colors, are paying more for their material than necessary. By using distemper colors they will get good results, even when used on cloth signs and window bulletins. Distemper colors are finely ground in water, packed in glass jars in semipaste form, and inexpensive. If distemper colors are not obtainable, dry colors, carried by all paint stores, may be used, although they are not so finely ground as the distemper. Fill a drinking glass one-

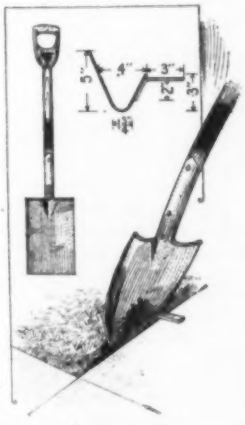
third with dry or distemper colors, to which a little distilled water has been added to make a thick paste. Add dextrin to thin the mixture sufficiently to use on the brush. Dextrin is a white or yellow powder. The white is preferable, as it does not affect the shade of the lighter colors. If the paste is too heavy, thin it gradually with water. I find dry French zinc white and drop black are best for general use.—Harry Martin, Portland, Ore.

Soldier Cuts Gift Cake with Sheet of Paper

A soldier at one of our army cantonments received a large cake, and there was no knife convenient to cut the cake. One of the men held a sheet of stiff paper taut along one edge, and sawed gently across the cake. The edge went through to the bottom of the cake like a razor. It is necessary to hold the edge of the paper straight for this purpose.—Verne E. Burnett, Battle Creek, Michigan.

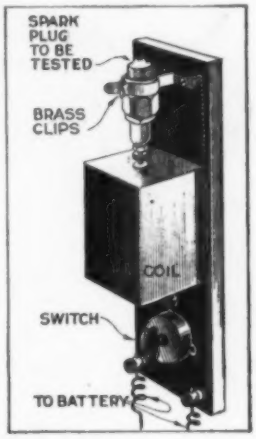
Spade Gauge for Keeping Edges of Lawn Neat

The usually difficult task of keeping the grass evenly trimmed next to a cement walk or drive is made easy by cutting away the sod with an old spade, made over for the purpose. The alterations consist in bending the blade so that the lower end is trough-shaped, and riveting an angular piece of strap iron to one side, as shown. With this implement a little trench can be made in the sod, the depth of which will be uniform because of the guide projecting from the side of the spade.



Spark-Plug Tester for the Auto or Shop

A spare coil, a few strips of iron, a small switch, and a piece of board are the materials needed to make the spark-plug tester illustrated. The iron strips are cut and bent, and holes punched in the bent-back ends so they may be mounted on the board, to form clips for the spark plug, as shown. The coil is mounted directly below the clips, the contact on the back of the coil being directly under the clips and at the proper distance to accommodate the spark plug. The clips are connected to one terminal of the primary winding, as indicated by the dotted line. A small switch, or push button, is used to close the circuit to the batteries. The plug to be tested is pressed between the clips, the terminal making contact with the contact on the coil. Closing the circuit immediately indicates the condition of the plug. There is no danger of receiving a shock while using this device.



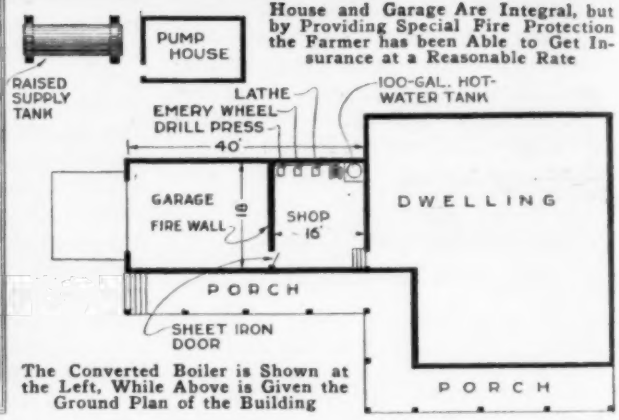
Reflected Light Helps Ripen Fruit

Fruit never ripens quite so well on the north side of the tree. So I make it a practice to place a white screen of canvas or wood on the north side of my trees, and find it very helpful. Similarly, after picking my tomatoes in semiripe condition, I place them on long shelves behind which long, narrow mirrors are placed at just the right angle to reflect the sun on the fruit. Thus the sun works double for me—both sides at once. Bright tin or other metal answers as well as mirrors. —F. E. Brimmer, Dalton, N. Y.

October 20 Cents

FARMHOUSE WITH GARAGE ATTACHED AT REAR

House and Garage Are Integral, but by Providing Special Fire Protection the Farmer has been Able to Get Insurance at a Reasonable Rate



The Converted Boiler is Shown at the Left, While Above is Given the Ground Plan of the Building

THERE are many conveniences to be derived by having a garage built integral with a residence. Such an arrangement is a common one in cities and suburban towns. Although just as convenient for the ruralist as for the city man, the idea has not, however, been widely adopted by the architects of farm residences. The difficulty in obtaining fire insurance for the country home so constructed has been one of the outstanding reasons for this. The owner of the brick residence illustrated herewith wanted it constructed with the garage connected at the rear as shown. He also wanted regular insurance rates. He got both without much difficulty. And here is the way he did it: By utilizing an old steam boiler, a water-supply tank, supported at a fair height above the ground, was provided adjacent to the garage. Pumps and a 10-hp. gasoline engine were installed in a structure next to the reservoir. The house and garage were piped so that fire protection was given. The pressure system also enabled an overhead irrigating system to be installed in a garden and greenhouse. The garage proper is 18 by 40 ft. in dimensions and divided into two rooms. One of these is utilized as a machine shop and supplied with power equipment for driving a speed lathe, drill press, and other machinery. The hollow-tile partition separating the two rooms was given a one-inch coat of asbestos-cement plaster on each side, and the sheet-iron door between them similarly fireproofed. By glancing at the accompanying plan, it will be observed that a 100-gal. hot-water tank is installed in the workshop.

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